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BUREAU OF HYGIENE AND TROPICAL DISEASES.

# TROPICAL DISEASES BULLETIN.

Vol. 44.] 1947. [No. 10.

## SUMMARY OF RECENT ABSTRACTS.*

## VIII. TYPHUS GROUP OF FEVERS.

### *General.*

ANIGSTEIN (p. 1031) discusses the nomenclature of the pathogenic rickettsiae and the diseases to which they give rise, without reaching any final decision. In comment, MEGAW restates briefly the arguments in favour of a classification of the typhus diseases by the vectors concerned, and gives his opinion that the time is not yet ripe for a final pronouncement on the nomenclature of the rickettsiae.

MOOSER (p. 611) has written a monograph on the relationship between murine and classical typhus, in which he maintains that the differences between *Rickettsia prowazeki* and *R. mooseri* are quantitative, but constant and therefore specific. He thinks that fleas may play a part in maintaining infection with *R. prowazeki* in inter-epidemic periods, and disagrees with the theory of carry-over by inapparent cases. GROUPÉ and DONOVICK (p. 726) have shown that there are specific differences between epidemic and murine rickettsiae, by vaccinating mice with each strain and challenging with toxin derived from each strain ; there was marked homologous, but no heterologous, protection in the doses employed. In relation to epidemic and murine typhus, HAMILTON (p. 320) records findings which suggest that complement-fixing antibodies are not identical with toxin-neutralizing antibodies, and that the toxins associated with the two diseases are distinct. CRAIGIE *et al.* (p. 914) have shown that, in the strains tested, epidemic and murine rickettsiae contained a common thermostable antigen, but that each had a type-specific thermolabile antigen.

PLOTZ *et al.* (p. 725) show that the complement-fixation test is the most reliable method of differentiating the rickettsiae of murine typhus, epidemic typhus and Rocky Mountain spotted fever in guineapigs, provided that the antigens employed are purified by washing to remove the " common " antigen. The consistently reliable results from this test are in striking contrast to the uncertain indications yielded by the febrile and scrotal reactions. MEGAW, in comment, points out that further investigation will be needed to show whether this is true of all strains.

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1946, v. 43. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

FITZPATRICK (p. 540) describes studies on the cultivation of rickettsiae in yolk sacs ; the paper contains many technical details which should be read in the original.

*Proteus OX19 type. Vectors : louse and flea.*
*Louse typhus.*

*Epidemiology.*—A detailed clinical description of louse-borne typhus as seen on the German side during the war is given by SYLLA (p. 114) ; on the whole it was mild.

GRENOILLEAU (p. 22) reports on the epidemics of louse-borne typhus which occurred in Algeria during the winter and spring of the years 1941 to 1943 ; although several hundreds of thousands of cases were notified, the author thinks that the true incidence was 5 or 6 times as great as the official figures indicate.

SACHS (p. 729) describes the features of typhus as it occurred in troops in Iran and Iraq during 1942–43. The powder A.L.63 was useful for disinfestation, and a Cox-type vaccine reduced incidence and mortality in those for whom it was available (about one-quarter of the troops). Rickettsia-agglutination tests indicated that most cases were of epidemic type, but that a few were murine ; the epidemic strain was very virulent for guineapigs. A " Precipitin Colloid Test (Platinum Chloride) " is described. HABIBI (p. 1129) states that there were 15,500 cases of typhus in Iran in January–July, 1943 ; the fatality rate was 17–20 per cent.

*Aetiology : Transmission.*—GIROUD (p. 913) describes minute homogeneous bodies derived from typhus rickettsiae, and analogous to bacterial spores.

SHEPARD and WYCKOFF (p. 913) have investigated the soluble antigen from typhus rickettsiae, by means of the electron microscope.

SNYDER *et al.* (p. 426) show that *Gerbillus gerbillus* and *G. pyramidum*, found in abundance near Cairo, are highly susceptible to epidemic and murine typhus, and ZARAFONETIS (p. 427) that they are susceptible to scrub typhus.

CHUNG (p. 321) shows that *Phthirus pubis* may harbour *R. prowazeki*, and may even transmit it, but has not proved multiplication in that louse.

*Pathology.*—BRUG (p. 321) gives a warning that granules are to be found in human lungs which closely resemble rickettsiae and which may easily be mistaken for them.

FALIN (p. 24) has studied changes which occur in nerve fibres and nerve endings in the skin and some other organs in typhus ; the sympathetic system is chiefly involved.

IONESCO-MIHAIESTI and CIUCA (p. 321), and BABLET and GIROUD (p. 322), describe the pathological histology of mice infected with *R. prowazeki* by the nasal route, and NYKA (p. 119) the same when epidemic and murine strains are used.

*Tests.*—DICK (p. 726) studied the Weil-Felix test in typhus and in other diseases, in British troops in the Middle East ; with the technique used, a titre of 1 in 240 was regarded as suggestive, and of 1 in 480 as very suggestive. In all typhus cases the latter was reached or passed, but in typhoid and other fevers it was reached only very rarely, and the titre usually fell (instead of rising), later in the disease. Sometimes there were rising-titre agglutinations but at low levels in these other fevers.

V. BORMANN and PREUSS (p. 324), in their original paper, have summarized the numerous rapid modifications of the Weil-Felix reaction, and describe the results obtained by the method they have devised. LORENTZ (p. 117) reports the results of a large series of tests carried out by the dry-leaf technique, in typhus. A weakly positive result corresponds roughly to a positive Weil-Felix test at a titre of 1 in 200. LEÓN (p. 731) describes a rapid test, on the principle

of the Kahn test, with an antigen prepared from *Proteus OX19*, which gives results closely resembling those of the Weil-Felix test.

VARLEY and WEEDON (p. 210) describe the quantitative complement-fixation test in typhus; this is a highly specialized procedure.

GIROUD and GIROUD (p. 322) investigated the rickettsia-agglutination, serum-protection, and skin-sensitivity tests after vaccination against typhus and after attacks of that disease. The agglutination test gave irregular results, as did the sensitivity test, but the serum-protection test gave results consistent with the amount of antigen injected, or with the severity of the disease; after severe attacks this test remains positive for many years. The authors regard the agglutination test as an index of "antibodies of infection", rather than of immune antibodies. The tests are described. D'IGNAZIO and CODELEONCINI (p. 1130) have found the Weigl rickettsia-agglutination more reliable than the Weil-Felix test, in that it never becomes positive in patients suffering from diseases other than typhus.

IMBROSCIANO (p. 732) uses polysaccharides from *Proteus X19*, and from *R. prowazeki*, for skin tests, which, he claims, give inflammatory reactions in healthy persons, but not in typhus from the 5th or 6th day onwards.

LEÓN and CANO (p. 731) have confirmed previous work by Smorodintzeff and Drobyshevskaya, in demonstrating an antigen in the blood of typhus patients before the 10th day of illness; as antibodies are formed, the antigen ceases to be detectable, and the test is therefore useful only in the early stage.

*Clinical Findings.*—MOOSER and LÖFFLER (p. 543) describe a case of Brill's disease in Switzerland, in which the patient, who had typhus in 1918, and had been remote from further opportunity of infection for many years, had an apparently greatly delayed relapse in 1945. The complement-fixation test was strongly positive with epidemic antigen, much less so with murine. They discuss the implications of this disease.

BRUMPT and MACLOUF (p. 835) mention a case in which the incubation period of typhus was apparently 31 days or more.

Writing of the epidemic of typhus in Santiago in 1937–39, MACCHIAVELLO and CIFUENTES (p. 23) make the point that as an outbreak draws to an end, the proportion of mild and atypical attacks tends to increase. They give clinical details of the cases.

GRÜBEL (p. 118) found definite evidence of some degree of circulatory insufficiency in 81 per cent. of patients 4 weeks after the onset of typhus, but this was reduced to 32 per cent. at 12 weeks. From electrocardiograph studies he concludes that permanent myocardial damage is rare.

SCHÄFER (p. 210) has investigated the blood content of chloride, sodium, potassium, calcium and proteins in typhus. The findings suggest changes in capillary permeability, with diminution of plasma volume.

YEOMANS *et al.* (p. 636) show that a series of Egyptian patients with typhus exhibited azotaemia with albuminuria, reduction in the amount of urine, and dehydration. Residual nephritis, however, was exceptional. In comment, MEGAW points out that other workers have recorded very different findings, and that the diet given to these patients was apparently inadequate and the amount of fluid small. These circumstances, combined with a poor state of nutrition and severe disease, may account for the exceptional frequency of azotaemia recorded.

DUENSING (p. 211) and GÄRTNER (p. 211) describe nervous sequelae of typhus.

Psychoses may occur in any stage of typhus, and even in inapparent attacks; AUBIN (p. 322) discusses the subject, and concludes that typhus may be the sole cause.

*Treatment.*—YEOMANS *et al.* (p. 24) treated patients in Cairo, suffering from louse-borne typhus, with concentrated hyperimmune rabbit serum, injected intravenously each day. The results were apparently very good in patients

treated within the first 3 days of illness; there were no deaths in the series of 25 (8 deaths in 44 not so treated), and the attacks were all mild. It appears, however, that para-aminobenzoic acid had a more favourable effect on patients who came under treatment after the third day. RAETTIG (p. 211) writes emphatically in favour of human convalescent serum in the treatment of typhus; he prefers doses of 40–60 cc. given daily by the intravenous route, rather than a single large dose.

SCHÖNBRUNNER (p. 118) writes of the value of strophanthin and digitalis in typhus, whether the circulatory failure is due to myocarditis or to damage to the vasomotor centres.

BERGER and BRZEZINSKI (p. 543) have shown that certain sulphonamides have some power to neutralize the toxic effect of injection of typhus rickettsiae, and that this antitoxic action is inhibited by *p*-aminobenzoic acid.

ANDREWES *et al.* (p. 427) have written a highly technical paper on the anti-rickettsial action of *p*-sulphonamidobenzamidine and related compounds.

MACCHIAVELLO *et al.* (pp. 1032, 1033) show that large doses of vitamin C, in animals infected with typhus, have an antipyretic action, but may themselves be toxic and have no anti-rickettsial effect. In human cases of typhus (epidemic type) there was some slight evidence of benefit, but death took place in 5 of 23 patients so treated. *In vitro* there is no evidence of anti-rickettsial action other than that attributable to the acidity of ascorbic acid. D'IGNAZIO (p. 1130) claims that treatment with intravenous vitamin C and intramuscular vitamin $B_1$ produces obvious improvement in typhus, and reduces the fatality rate (in Abyssinia) from 24–27 per cent. to 12–13 per cent.

*Vaccination.*—TOPPING, BENGTSON and their collaborators at the National Institute of Health, Washington (p. 18) carried out researches on typhus during the war, which were published only in 1945. These papers contain much detail on the preparation and properties of vaccine against epidemic typhus strains, on a toxic substance in yolk-sac cultures, and the mouse-neutralization test to measure antibody provoked by this substance, on the antigenicity of various strains of the rickettsiae and on a precipitin test in typhus fever. Readers should refer to the originals.

CRAIGIE (p. 834) describes two methods of purifying triturated yolk-sac suspensions of rickettsiae, for the preparation of vaccine, and TOPPING and SHEPARD (p. 910) describe three methods of preparing antigen from yolk sacs infected with rickettsiae, which are all based upon Craigie's diethyl ether method. Details are given in the original.

Although the toxic and the complement-fixing substances formed during the growth of *R. prowazeki* are not identical, the former being destroyed by formol and ether, and the latter not, GROUPÉ and DONOVICK (p. 635) have shown that the titres of both increase the longer the embryos live after inoculation. Vaccines prepared from embryos alive after 7 days are much more protective than those from embryos dead in 5 days.

DONOVICK *et al.* (p. 635) show that a direct determination of the antigenic titre of a vaccine of *R. prowazeki* by the complement-fixation test appears to give an accurate measure of its protective value for guineapigs.

ECKE (p. 116) shows the Weil-Felix and the rickettsia-agglutination titres in a group of persons vaccinated with the Weigl or the Cox vaccine. ZARAFONETIS (p. 541) found relatively few positive responses to the Weil-Felix and the complement-fixation tests in persons who had had several doses of Cox-type epidemic-typhus vaccine, and that a stimulating dose did not greatly, or for long, increase the titre of the Weil-Felix, though the effect on the complement-fixation test was quite striking. There was considerable cross-fixation when epidemic and murine antigens were used, which indicates that *R. prowazeki* and *R. mooseri* may be variants of the same species rather than separate species. He (p. 542)

shows that fevers other than typhus do not, for all practical purposes, give rising titres of these tests in persons who have previously been vaccinated against typhus.

D'IGNAZIO and CODELEONCINI (p. 1131) have used the Weigl vaccine in Abyssinia; even in relatively small doses it reduces the incidence and severity of the disease in exposed persons.

In Algeria, Blanc's live murine vaccine was used with striking success in the epidemics of louse-borne typhus which occurred during the war, but a drawback was that it caused attacks of murine typhus in 5–6 per 1,000 of those vaccinated. A killed vaccine (Durand-Giroud) was also a success in that it protected against death and was completely safe. The epidemic was controlled by the use of these vaccines, for insecticides could only be used on a small scale (GRENOILLEAU, p. 22).

ZARAFONETIS *et al.* (p. 912) describe cases of typhus (epidemic or murine) in persons who had received epidemic vaccine of the Cox type, and record the results of Weil-Felix and complement-fixation tests at various stages. The latter are reliable in differentiating the diseases in vaccinated persons provided that allowance is made for a high degree of cross-fixation. ECKE *et al.* (p. 545) report 61 patients who, among a large number exposed in the course of their work in the Cairo Fever Hospital, contracted typhus although they had previously been vaccinated against it; there was one death, in a man who had received a single dose of vaccine 3 days before the onset of illness. The findings suggest that administration of vaccine during the incubation period may reduce the severity of the disease, and vaccination should therefore be carried out even during an epidemic. SILVA and KOPCIOWSKA (p. 428) report two cases of typhus, both mild, in laboratory workers who had repeatedly received injections of vaccine.

*Control.*—CHALKE (p. 911) relates the experiences of the British forces in North Africa and Italy, in relation to typhus. Vaccination with the living murine vaccine of Blanc, and disinfestation, were used for native labourers in Algeria, but in Italy, reliance was chiefly placed on the insecticidal powders. In a discussion on DDT, the same author (p. 835) claims that the initial control of the Naples epidemic was effected through intensive search for cases, and the use of the Powders A.L. 63 and MYL. The epidemic was finally ended by the large-scale use of DDT. The same point is made by CRAUFURD-BENSON (p. 638). CRAUFURD-BENSON and MACLEOD (p. 638) describe the steps which led to the composition of the original British Army louse powder A.L.63, a mixture of naphthalene, high boiling tar acids, derris root and China clay. Applied to garments, the powder protected against infestation for about 8 days.

WHEELER (p. 639) gives an account of the use of DDT in Naples and Southern Italy, 1943–44, when the epidemics of typhus were quickly brought under control; he describes the organization controlled by the U.S.A. Typhus Commission. DAVIS (p. 427) has written an account of the means taken to control the typhus epidemic found when the Belsen camp was entered. Dusting with DDT brought it to an abrupt end, and this is strong evidence that transmission had been effected by living lice rather than by dry louse faeces. Vaccination gave protection to those who were attending to the camp prisoners, and although there were a few cases in vaccinated persons, they were mild. CAVAILLON *et al.* (p. 544) show that there was little typhus in France as a result of repatriation of prisoners from Germany at the end of the war, and attribute this to the extensive campaigns of disinfestation with DDT that were inaugurated. There was little disinfection of clothing or administration of vaccine. ORTIZ-MARIOTTE *et al.* (p. 324) show how, by the use of DDT, an epidemic of louse-borne typhus was brought to an end in Mexico. VIEL and ROMERO (p. 545) draw attention to the ease with which an outbreak of typhus in Chile was

controlled by the use of DDT, compared with another outbreak which occurred before DDT was available.

*Flea Typhus.*

BOVENTER and FISCHER (p. 546) describe four cases of typhus of the murine type in Sicily.

NEUJEAN (p. 324) refers to an outbreak of disease in the Belgian Congo, in 1939–40, in which rickettsiae said to be of murine type were isolated from lice, fleas, ticks and especially bed-bugs. The reservoir host was the rat. The author claims to have found rickettsiae in the blood of 50 persons examined, whether sick or healthy, and states that the rickettsiae can easily be cultivated by adding the patient's blood to saline. He claims great advantage from the staining method of Lestoquard, which he describes. These are unusual findings, and are not likely to be accepted without confirmation. LE GAC (p. 916) describes a typhus-like fever of the Upper Ivory Coast and French Equatorial Africa, in which there is strong, though not conclusive, evidence of rat-flea transmission from wild rats. Tests with the recognized strains of *Proteus* are inconclusive.

Of 10 cases of typhus treated in Calcutta, mostly in patients from the city, 4 were diagnosed as scrub typhus, 4 as murine, 1 as tick typhus and 1 indeterminate (LOWE, p. 1129).

WOODWARD *et al.* (p. 836) show that murine typhus is present in rats in the Philippines, and mention three human cases.

PANG (p. 325) reports on an epidemic of typhus in a poor-house in China, in which the strains of rickettsiae isolated were regarded as murine, but in which transmission was believed to be by lice.

MILLER and BEESON (p. 732) describe murine typhus in Georgia, U.S.A. and remark that contact with the faeces of rat fleas, or with urine of infected rats, must be considered as possible means of human infection. STUART and PULLEN (p. 836) think that the incidence of human cases of murine typhus in New Orleans is increasing ; it is most prevalent in summer and early autumn. DAVIS and POLLARD (p. 1033) found complement-fixing antibodies to a murine antigen, in 3·5 per cent. of persons engaged in food handling in Texas. It appeared that in many cases the disease had never been recorded, presumably because the attacks were sub-clinical.

PASCALE and CRUZ (p. 546) report cases of murine typhus from Brazil, and cases in which *Proteus OXK* was agglutinated. In comment, MEGAW suggests that the *Proteus* strains used in the tests were not always true to type.

From an examination of the seasonal variations in rats, fleas and lice, RUMREICH and KOEPKE (p. 429) conclude that *Xenopsylla cheopis* is the principal, or an important, vector of murine typhus in certain parts of the United States, but that there is no evidence that it is so in Honolulu.

GREIFF and PINKERTON (p. 22) show that the growth of murine rickettsiae in the yolk sac of hen's eggs is affected by temperature and by the introduction of potassium cyanide solution or toluidin blue. In suitable doses the potassium cyanide greatly stimulated the growth of rickettsiae, but this substance did not neutralize the inhibitory action of para-aminobenzoic acid. There is much detail in this paper.

JOHNSON and DAMON (p. 915) show that complement-fixation tests for murine typhus are quite commonly positive in healthy persons in an endemic area. This may be important in the assessment of the value of this test in febrile diseases in those areas. LE CHUITON and BERGE (p. 915) discuss the Widal and Weil-Felix tests in patients with murine typhus, who have previously received TAB vaccine.

SMITH (p. 1131) indicates that treatment with *p*-aminobenzoic acid was of some value in 29 cases of murine typhus, but remarks that caution is necessary

in patients with kidney or liver damage. ANDREWES *et al.* (p. 728) show that methylene blue and toluidine blue have some therapeutic action when administered orally or subcutaneously to mice infected by the nasal route with murine rickettsiae.

PLOTZ and WERTMAN (p. 429) have observed that in persons vaccinated with epidemic-typhus vaccine, subsequent infection with murine typhus leads to anomalous results with the complement-fixation and rickettsia-agglutination tests; moreover, the vaccine had little or no effect on the severity of the attack of murine typhus.

The rat-control programme adopted for the control of murine typhus at Memphis, Tennessee, is described by BEALL (p. 639).

*Proteus OXK type. Vector: mite.*

*Epidemiology: Transmission.*—MACKIE *et al.* (pp. 917, 1132) give a comprehensive account of the American investigation into scrub typhus in Assam and Burma, during which the rickettsia was found in wild *Rattus flavipectus yunnanensis*, in the tree shrew *Tupaia belangeri versurae* and in mites obtained from *R. rattus sladeni*. The only mite found infected was *Trombicula deliensis*. Partly-fed mite larvae would re-attach themselves to new hosts, and could infect them. In the discussion of the second of these papers, MELLANBY mentioned the protective properties of benzyl benzoate, and SAYERS the fact that there was a seasonal factor, with highest incidence in August or September,

LUSK (p. 426) shows that the great majority of a series of 114 cases of typhus fever, admitted to an Indian military hospital in Calcutta, were of the *Proteus OXK* (and presumably mite-borne) type. A few were flea-borne or tick-borne. The patients came from Calcutta or from a village 80 miles away.

PHILIP *et al.* (p. 733) describe 222 cases of scrub typhus in American troops who reoccupied the Philippine Islands. *Trombicula deliensis* and *T. akamushi* were found, the important host being *Rattus mindanensis*.

ANDERSON and WING (p. 326) describe an outbreak of scrub typhus among troops on a Pacific island.

PHILIP and KOHLS (p. 119) have, for the first time, found larval *Trombicula deliensis* infected with *Rickettsia orientalis* in nature, in a small island in the Pacific which is uninhabited except for periodic visits to collect coconuts, and which swarms with *Rattus concolor browni*. Scrub typhus of a severe type was contracted by at least 26 of 41 men who camped on the island early in 1944.

JOHNSON and WHARTON (p. 640) describe the life history of the larval mites implicated in scrub typhus, and the habits of the rat hosts, which tend to nest in places otherwise suitable for camping. He also deals with prevention, mentioning dimethyl and dibutyl phthalate for use on clothing, DDT for soil, and rat control.

FINNEGAN (p. 262) has written a monograph on Acari which transmit fevers of the typhus group in the Far East.

*Aetiology.*—TOPPING (p. 31) found cross-immunity between 4 strains of *Rickettsia orientalis* from different countries of the Far East, though they differed in virulence. IRONS (p. 734) has shown experimentally that strains of *R. orientalis* of high and of low virulence to mice are found in different places, and that they are associated with severe and mild cases, respectively, in man.

HAMILTON (p. 734) describes vascular, nodular masses produced on the chorioallantoic membrane of 10-day embryo chicks on inoculation with *R. orientalis* and other rickettsiae.

CLANCY and WOLFE (p. 641) describe a rapid staining method for *R. orientalis*.

*Tests.*—IRONS and ARMBRUST (p. 550) give an account of the Weil-Felix reaction in relation to the clinical course of scrub typhus. The original paper

contains valuable charts showing the relationship, though some of the conclusions are criticized by MEGAW.

DE BURGH (p. 642) has extracted from *Proteus OXK* a polysaccharide with which he sensitized collodion particles. These were agglutinated by sera of two patients convalescent from scrub typhus at the same titre as suspensions of *Proteus OXK*. This polysaccharide also gives positive results in a precipitin test.

WOLFE *et al.* (p. 735) have worked out a method of large-scale preparation of the complement-fixing antigens from yolk-sac cultures of *R. orientalis*; this can also be applied to other rickettsiae. The antigens are moderately active, and strictly specific, when subjected to complement-fixation tests. BENGTSON (p. 551) found that the complement-fixation titres of animals and human beings infected with different strains of *R. orientalis* vary very greatly according to whether homologous or heterologous antigen is used in carrying out the test. Cross-immunity exists between the strains used, and it remains to be found whether there is an association between the fixation titre and the degree of immunity.

SMADEL *et al.* (p. 547) have found soluble antigens in the tissues and body fluids of mice and rats infected with two strains of scrub typhus rickettsiae. These were specific. They could be found up to about the 6th day, but not longer, presumably because by that time neutralizing antibodies had been formed.

O'CONNOR (p. 642) notes that *R. orientalis* grown in duck embryos may cause agglutination of fowl red cells (the Hirst phenomenon), and that serum of patients with scrub typhus may inhibit this property.

*Pathology.*—ALLEN and SPITZ (p. 25) have conducted a detailed histological examination of material from a considerable number of cases of scrub typhus, epidemic typhus and Rocky Mountain spotted fever. There is, of course, a great similarity between these diseases, but the authors point out certain finer details in which they differ. It is not possible further to summarize this paper. SETTLE *et al.* (p. 27) also give a detailed description of the pathology of scrub typhus, and compare this with the pathology of other fevers of the typhus group. They make the point that the tissue changes in these diseases do not differ in essentials. For details the original should be consulted. MCGOVERN (p. 30) describes the pathology of scrub typhus, emphasizing that myocarditis, pneumonitis and meningo-encephalitis in this disease appear to be secondary to vasculitis.

*Clinical findings.*—ANDREW (p. 121), from Queensland, shows that in severe scrub typhus the incubation period tends to be about 12 days; in less severe forms it tends to be rather longer, up to 18 days. The same author (p. 549) describes a sudden diuresis which was a feature of a group of severe cases of scrub typhus in N. Queensland. It usually began on the 10th–16th day of disease, and was accompanied by striking improvement and disappearance of oedema which had been masking the pronounced degree of anaemia from which the patients suffered. The author argues that these findings reinforce warnings against deranging fluid balance in scrub typhus by intravenous infusions.

Descriptions of the clinical features of scrub typhus are given by several authors (TATTERSALL, p. 28; TATTERSALL & PARRY, p. 430; SANGSTER & KAY, p. 29; KLEIN, p. 120; ANDERSON & WING, p. 326; GRIFFITHS, p. 431; BROWNING *et al.*, p. 548; MENDELL, p. 548; AGRESS & EVANS, p. 549.) The incidence of primary ulcer varied; it was 9–11 per cent. in Tattersall's series, but from 34 to 92 per cent. in the rest. The rash was seen (in white patients) in 28–98 per cent. Enlarged glands were common (90–100 per cent.), and splenomegaly fairly common (25–47 per cent.) [but malaria may have been a factor].

Cough, and signs of chest trouble, were present in 40–100 per cent., eye troubles in 45–71 per cent., and deafness in 15–35 per cent. The usual accompaniments of fever—headache, backache, flushing etc.—were seen, but secondary fever was also reported in 15–17 per cent. of Tattersall's cases. Haemorrhage occurred from mucous membranes in 9 and 33 per cent. of two series. The case mortality rates varied from 2·6 to 12 per cent.

DESHMUKH (p. 432) gives details of the clinical picture in 200 severe cases, out of 615 in East African troops in Burma, and of the post-mortem appearances in fatal cases.

SANGSTER and KAY (p. 29) note that the clinical picture in scrub typhus in New Guinea was complicated by malaria and other diseases. They mention cardiac dilatation occurring about the 12th–14th day in severe attacks, and the importance of complete rest for 6 weeks from the onset.

DONEGAN (p. 550) describes the ocular changes found in scrub typhus. These appear to be the result of vascular upset. DAME (p. 122) discusses the eye and ear sequelae of scrub typhus; they are usually not serious.

HICKS (p. 1134) found reactions at 1 in 80 with *Proteus OXK* in greater proportions of people exposed to scrub typhus, and in Natives of New Guinea, than in others not exposed. He thinks that sub-clinical infection may occur [compare DAVIS & POLLARD, and JOHNSON & DAMON, *Flea typhus*, above].

HOWELL (p. 327) notes that there were no abnormal electrocardiographic patterns in 200 consecutive patients convalescent from scrub typhus. SOKOLOW and GARLAND (p. 432) describe the cardiovascular disturbances in a number of men referred for special observation after scrub typhus. The symptoms were weakness, dyspnoea, tachycardia and pain, and some minor electrocardiographic changes were found in a few cases. The pathogenesis is doubtful, but all the evidence went to show the disturbances were due to scrub typhus. Treatment resulted in progressive improvement. LIKOFF (p. 1133) found electrocardiographic abnormalities in 10 of 100 patients observed for 7 weeks after scrub typhus; in 5 these changes persisted for 7 weeks. The most significant were bundle-branch block (2 patients) and intraventricular block (1 patient).

ROMEO (p. 1133) gives his opinion that patients who survive scrub typhus make complete and permanent recovery. The first step in convalescence is to dispel the apprehension common in this disease. In comment, MEGAW agrees in principle, but points out that the case-mortality rate in this author's series was only 4 per cent., and that in more severe outbreaks the end results may not be so good.

*Treatment.*—TOPPING (p. 212) shows that immune rabbit serum is useful in the treatment of mice infected with homologous strains of *R. orientalis*, even as late as 72–168 hours after infection. He thinks that scrub typhus is specially favourable for serum treatment because the presence of the eschar permits immediate diagnosis.

MURRAY *et al.* (p. 433) show that *p*-aminobenzoic acid has very considerable power to prevent death in gerbils inoculated with *R. orientalis*, when treatment is started very soon after infection, and if the compound is given both by mouth and by subcutaneous injection. TIERNEY (p. 920) treated 18 patients suffering from scrub typhus with *p*-aminobenzoic acid (8 gm. initially, followed by 3 gm. every two hours was an effective dose, given with bicarbonate of soda, but was modified for different patients). The results on fever, symptoms and severity were very promising, in comparison with the course of the disease in alternate-case controls. Overdosage led to mental confusion and leucopenia but these did not persist. Details of treatment, and the precautions to be taken, should be sought in the original.

ZARAFONETIS *et al.* (p. 922) found that gerbils which had recovered from experimental infection with scrub typhus with the help of *p*-aminobenzoic

acid, showed complete immunity afterwards; this indicates that the action of this substance is to inhibit the growth of the rickettsiae, rather than to kill them.

*Vaccination.*—FULTON and JOYNER (p. 435) describe the cultivation of *R. orientalis* in the lungs of mice and cotton rats, after intranasal instillation, and the preparation of a vaccine from the lungs. After a few passages the strain produced lesions which were constant; bacterial infection of the animals' lungs was controlled by means of sulphathiazole. The vaccine afforded a moderate protection to experimental animals, but the authors argue that this is not a certain criterion of its effect in man, which can be determined only by a field trial. [The war ended before the vaccine could be used in man on a large scale.] BUCKLAND *et al.* (p. 436) have recounted the story of the large-scale production of scrub-typhus vaccine by the method described above. For the full details of this remarkable achievement, the original should be consulted.

SMADEL *et al.* (p. 919) describe the preparation of a vaccine of *R. orientalis* from the lungs and spleens of white rats infected intravenously. Tests in animals indicated that this vaccine was as potent as the cotton-rat lung vaccine, or the tissue-culture vaccine. By this technique, bacterial contamination was not a problem, as it is in the cotton-rat lung method, in which the animals are infected intranasally.

PLOTZ *et al.* (p. 920) describe the preparation of a tissue-culture vaccine of *R. orientalis* which, though large-scale preparation would be difficult, gives a clean product and could be used for the protection of small groups. The authors note that no yolk-sac vaccine of this species has been successful, partly because of the deleterious effect of ether on the antigen.

VAN DEN ENDE *et al.* (p. 918) report 4 cases of scrub typhus in persons engaged in preparing vaccine for that disease, and handling infected cotton rats. They had all previously been vaccinated, and though the disease was severe in two, there were no deaths, and the vaccine, therefore, is thought to have given some protection.

*Control.*—In one outbreak of scrub typhus in United States troops in Dutch New Guinea there were 931 cases and a case-mortality rate of 3·65 per cent. GRIFFITHS (p. 431) describes the semi-cleared, grassy areas in which most of the cases occurred, and states that removal of grass and undergrowth was an effective measure of control, and that when the top soil had eventually dried after this procedure, the area was considered safe. There was no evidence that rat control was of any practical value, but impregnation of clothing with a soap emulsion containing dimethyl phthalate was strikingly successful. BUSHLAND (p. 922) impregnated garments with an emulsion of 5 per cent. dimethyl phthalate in soap and water, and found that this gave good protection for 5 weeks against larval mites in New Guinea; protection was lost after proper laundering. The same author (p. 923) shows that benzyl benzoate and dibutyl phthalate are even more effective and withstand washing better; he therefore advocates a mixture of these two substances. MCCULLOCH (p. 1034) describes investigations made in Australian troops, on the efficacy of dibutyl phthalate in preventing scrub typhus and scrub itch. He notes that dimethyl phthalate kills, but does not repel, mites. One ounce of dibutyl phthalate (which is more efficient than dimethyl phthalate) is enough for one set of service clothing, and the protective effect survives washing with soap and running water (as available to troops in the field) up to 8 times, though two laundry washings destroy the protective action. Woollen clothing (including socks) loses protective action more quickly than cotton. The substance rarely irritates the skin. Experience showed that the protection offered was very effective.

*Indeterminate type. Vector: tick.*

BRODY (p. 1036) reports a case apparently of tick typhus in N. Queensland, noting that this disease had not previously been recorded in Australia.

SOMERS (p. 327) describes the first case of tick typhus to be reported from the Sudan. CHARTERS (p. 551) reports 5 cases diagnosed as tick typhus, in Abyssinia; he suspects that the vector was *Rhipicephalus sanguineus*.

BUSTAMANTE *et al.* (p. 1134) have isolated two strains of the rickettsia of Rocky Mountain spotted fever (western type) from *Rhipicephalus sanguineus* in Mexico. MAZZOTTI and VARELA (p. 1135) maintained a strain of the rickettsia of Rocky Mountain spotted fever for 345 days in *Ornithodorus furcosus*. The tick transmits the infection through the egg at least to the first generation.

SHEPARD and TOPPING (p. 735) produce evidence which suggests that dogs may be reservoir hosts of Rocky Mountain spotted fever, as they are of other tick-borne rickettsial diseases. JELLISON (p. 31) discusses the geographical distribution of one species of cottontail rabbit, *Sylvilagus nuttallii* (an important host of *Dermacentor andersoni*) in relation to that of Rocky Mountain spotted fever in U.S.A. The correspondence is very close, and other species of *Sylvilagus* occur in other American countries where this disease is found.

TRAVASSOS and VALLEJO-FREIRE (p. 642) describe the breeding of *Amblyomma cajennense*, its infection from rabbits infected with São Paulo spotted fever, and the preparation of a vaccine from these ticks.

HAMILTON (p. 434) describes the inhibiting effect shown by *p*-aminobenzoic acid on the growth of rickettsiae of Rocky Mountain fever in infected yolk sacs. The effect was less pronounced on the rickettsiae of other forms of tick-borne typhus, and was not found in the case of *R. orientalis*, *R. burneti* and certain viruses. ROSE *et al.* (p. 433) report a case of Rocky Mountain spotted fever in which treatment with *p*-aminobenzoic acid had a strikingly beneficial effect. ANIGSTEIN and BADER (p. 1036) quote experiments which indicate a strong protective action of *p*-aminobenzoic acid in guineapigs infected with Rocky Mountain spotted fever. The animals which recovered were found to be immune [compare ZARAFONETIS *et al.*, *Mite typhus*, above], but rickettsiae could be recovered from their spleens.

HARRELL *et al.* (p. 923) show that a high protein diet is beneficial in Rocky Mountain spotted fever.

GLASGOW and COLLINS (p. 924) have found a mixture containing DDT and pyrethrins, in oil, effective against *Dermacentor andersoni* when sprayed in areas infested by this tick.

*Q fever. Trench fever.*

MORRISSEY and DERRICK (p. 31) refer to the 216 cases of Q fever diagnosed in south-east Queensland in 10 years, and describe the first confirmed case in North Queensland. Bandicoots and cattle are numerous in the locality in which this patient lived, and *Haemaphysalis humerosa* has been reported in North Queensland.

IRONS *et al.* (p. 924) report an outbreak of Q fever in stockyard men in Texas.

PARROT (p. 328) suggests that some of the cases diagnosed in Algeria as "relapsing fever without spirochaetes" may be examples of trench fever, and describes a case.

*Charles Wilcocks.*

## MALARIA.

FERMONT, D. A. **Primary Malaria in London.** [Correspondence.] *Brit. Med. J.* 1947, July 5, 31–2.

This letter records a further case of malaria in London [see this *Bulletin*, 1947, v. 44, 789, 790]. The patient was a woman of 36, who lived in Kensington and worked at Eastcote. She was first seen last May with symptoms suggesting "gastric 'flu," and had a temperature of 101·4°F. : this fell to 99°F. next day and she felt a little better. Two days later she moved to Hampstead. She was apyrexial and felt that she had recovered. On the third evening after her attack, symptoms recurred and became more typical of malaria, with a temperature of 102·4°F. Next day blood slides were negative during an apyrexial period : but on the following day, slides taken during a rigor revealed scanty trophozoites, amoeboid forms and gametocytes of *Plasmodium vivax.* The patient was given mepacrine and has remained free of symptoms since her attack.

The patient had not been out of London since December 1946. She was born in India and lived in Calcutta until 1937, when she came to Britain : she had never had any form of antimalarial treatment hitherto. Her only illnesses have been German measles and 3-day fever 24 years ago. Her only known contact with malaria was when a friend staying in her home last March had a relapse.

[In view of the history of residence in the Tropics, even though this was 10 years ago, this case is not exactly comparable with those recently recorded as "primary malaria in London."] *H. J. O'D. Burke-Gaffney.*

MACKERRAS, I. M. **Malaria in the South-West Pacific.** [Correspondence.] *Med. J. Australia.* 1946, Aug. 17, v. 2, No. 7, 249–50.

The author refers to FAIRLEY's paper on Malaria in the South-West Pacific [this *Bulletin*, 1947, v. 44, 398] with special reference to the account of the Wewak epidemic, in which a relatively mepacrine-resistant strain of *P. falciparum* was encountered. Some additional epidemiological information is supplied. Native infants at Wewak were remarkably tolerant of heavy infections and developed an effective immunity at an unusually early age. On the assumption that the minimum concentration of gametocytes of *P. falciparum* in the blood likely to infect mosquitoes is 40 per cubic millimetre, the effective gametocyte rate of native infants was found to be 4·5 per cent. The corresponding rate for native children and adults was zero, for Japanese prisoners on the day of their surrender 4 per cent., and for Australian troops 0·6 per cent. Australian troops were, therefore, much more likely to obtain their infections from the Japanese or from native infants than from their fellows. This inference was supported by the results of mosquito dissections.

It is difficult to believe that mepacrine-resistance of the local strain of *P. falciparum* was a new character developed during the war, for it failed to appear elsewhere even though during 1943 and the first quarter of 1944 many troops were receiving inadequate doses of mepacrine. Mepacrine resistance might have been an inherent, incidental characteristic of a local strain, or it might have developed by mutation and selection in the Japanese ; it could scarcely have done so in Australian troops. The Japanese had been in occupation two years or more, and they had atebrin. *Norman White.*

BATISTA, D. Contribuição ao estudo da protozoologia da malaria na Amazónia. [**Malaria in Amazonas, Brazil.**] *Rev. Brasileira Med.* Rio de Janeiro. 1947, Mar., v. 4, No. 3, 226–31.

The author has analysed the protozoological findings in blood examinations for malaria at the Manaus Hospital during the four years 1940–43. The total examined at the laboratory was small, 801 altogether, of which only 276 were positive, 253 *P. vivax*, 14 *P. falciparum*, 8 with both these and one with *P. vivax* and *P. malariae*. Thirty-four patients were given adrenaline and 16 of these showed parasites in their blood thereafter, 14 *P. vivax*, 1 *P. falciparum* and 1 *P. ovale*. Figures are also given from the female section of the hospital for each year, as follows: 1940, 165 (23·1 per cent. of the total patients) and 9 deaths (5·4 per cent. case fatality); 1941, 247 (25·1) and 11 deaths (4·4); 1942, 269 (29·1), 11 deaths (4·0); 1943, 226 (26), 11 deaths (4·8). [The numbers are small and the article shows signs of careless preparation. Several of the percentage calculations are wrong and one table, purporting to give the figures for a certain specified period, contains actually those of a different specified period and the "positive findings" are recorded as "negative."]

*H. Harold Scott.*

SMOLENSKAJA, J. M. [**On the Localization of Schizogony in *P. falciparum*, the Causative Agent of Tropical Malaria.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 5, 25–7. [In Russian.]

In order to determine the exact localization of the reproductive stages of *Plasmodium falciparum*, the author examined 240 cases of malignant tertian malaria and compared the parasites found in the peripheral blood, on the one hand, with those in the bone marrow, spleen and venous blood on the other hand. While material obtained by sternal and spleen punctures contained only ring-forms and corresponded in this respect to the blood taken from the finger, blood obtained from the subcutaneous veins of the upper (*e.g.* median basilic and cephalic veins) and lower extremities contained stages of schizogony in 7 per cent. of cases examined (100). The density of parasites in the venous blood was also greater than in that taken from the finger. From these facts it is concluded that the peripheral regions of the venous system might represent the normal sites of schizogony of the M.T. parasite. *C. A. Hoare.*

SOFIYEV, M. S. [*Plasmodium ovale* **Malaria.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 4, 36–9. [In Russian.]

The author records observations carried out with a strain of *Plasmodium ovale* isolated in the Soviet Union by ESKIN [this *Bulletin*, 1938, v. 35, 814]. From 1936 to 1939, this strain infected 159 patients suffering from general paralysis, having been passaged both by blood inoculation and by mosquitoes. It is stated that in the course of 3½ years the strain retained the morphological peculiarities of *P. ovale*, thus proving that there was no admixture of *P. vivax*, as formerly suspected on account of the presence in the original strain of forms with characters of the latter species. The average incubation period following intravenous inoculation was 9·8 days, while that following subcutaneous inoculation was 13 days. The paroxysms appeared at intervals of 24 or 48 hours. The infections induced by blood inoculations terminated in spontaneous recovery, whereas those produced through the bite of mosquitoes had to be treated with acriquine. *C. A. Hoare.*

LISOVA, A. I., SOFIYEV, M. S. & ESKIN, V. A. [**Experimental Infection of Mosquitoes with** *Pl. ovale.*] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 4, 40–44. [In Russian.]

Using a Russian strain of *Plasmodium ovale* [described by ESKIN (this *Bulletin*, 1938, v. 35, 814) and SOFIYEV (see preceding abstract)], the author succeeded in producing experimental infections in *Anopheles sacharovi*, *A. superpictus*, *A. pulcherrimus* and *A. bifurcatus*, the percentage of positive results with the first-named species being 39, that with the second 29. The duration of the development of *P. ovale* in the vectors was 10 days at 27°C. and 20 days at 19·4°C. The Russian strain differs from the Congo strain of *P. ovale*, which was used by JAMES *et al.*, in a shorter period of development in mosquitoes, in the larger size of its sporozoites and in a long incubation period (7 to 7½ months) when transmitted to man by mosquitoes. [In an editorial comment accompanying this paper, it is stated that from the data adduced in this paper and in that by Sofiyev (see preceding abstract) it is doubtful if the strain in question belongs to *P. ovale*.] *C. A. Hoare.*

GALL, E. A. & STEINBERG, A. **Biochemical Studies during Malarial and Artificial Fevers.** *J. Lab. & Clin. Med.* 1947, May, v. 32, No. 5, 508–25, 2 figs. [50 refs.]

A reduction in serum inorganic phosphorus was observed to occur in patients with malaria ; the phosphorus level began to fall towards the end of the rigor when the temperature was rising, reached the minimum level when the fever attained its peak, and thereafter rapidly returned to normal. A similar reduction in phosphorus was observed in patients receiving artificial fever therapy. It was also found that the fall in phosphorus was accompanied by a rise in glucose, although the return to normal of the latter was prolonged compared with the return of the phosphorus level. It was thought that the hyperglycaemia resulted from an acceleration of metabolism and increased muscular tonus, and that the hypophosphataemia was associated with transient phosphorylation necessary for the formation of hexosephosphate and the deposition of the latter in the blood and tissues. This theory is supported by the observations that there is a reduction of serum phosphorus following the ingestion of glucose, or the administration of insulin, and that in diabetics a fall in blood sugar follows a parenteral administration of sodium phosphate. On the other hand it has been suggested that the serum phosphorus falls during a malarial attack because of the formation of phosphocreatine ; the authors were, however, unable to confirm that any significant elevation of blood creatine occurred. Another suggestion that the hypophosphataemia is due to the conversion of inorganic phosphorus to the organic state seems unreasonable since there is diminution of both organic and inorganic phosphorus. The theory that hyperglycaemia in artificial fever may be due to haemo-concentration seems incorrect in view of the concomitant fall in phosphorus ; in fact, there is evidence of mild haemodilution since the total serum proteins fall. No significant alterations were observed in the serum calcium, potassium, magnesium, creatine or creatinine levels during the febrile episodes. Many of the patients with malaria gave positive cephalin-cholesterol flocculation and thymol turbidity tests before and during the malarial paroxysms. Others gave a positive cephalin flocculation during the febrile period, the tests becoming negative when the temperature became normal ; in these cases, the thymol turbidity was negative throughout. Flocculation tests were negative with artificial fever. *F. Murgatroyd.*

GALLAIS, P. Les aspects neurologiques du paludisme. [**Neurological Aspects of Malaria.**] *Méd. Trop.* Marseilles. 1945, Jan.–Feb.–Mar., v. 5, No. 1, 3–53.

NISBET, T. W. **Dermatitis due to Quinacrine Hydrochloride ("Atabrine").** *J. Amer. Med. Ass.* 1947, May 31, v. 134, No. 5, 4469. [Refs. in footnotes.]

A review. [See also FINDLAY, this *Bulletin*, 1947, v. 44, 763.]

INNES, J. R. M. **The Effect of Intramuscular Injection of Paludrine and Mepacrine in Experimental Animals.** *Ann. Trop. Med. & Parasit.* 1947, May, v. 41, No. 1, 46–9, 3 figs. on 1 pl.

Paludrine is generally given orally or intravenously in clinical practice; it is rapidly absorbed when given by mouth. The author has now investigated the pathological effects which follow deep intramuscular injections of this drug and has compared them with those due to mepacrine (atebrin) on which HAWKING [this *Bulletin*, 1943, v. 40, 823] has made some observations. Rabbits, sheep, dogs, and calves were used as experimental animals and received doses of the drug comparable to those given to human beings. A 10 per cent. wt./vol. solution of paludrine lactate, and a 15·25 per cent. wt./vol. solution of mepacrine methanesulphonate were used for injection. The animals were killed 3 to 28 days later and careful search was made for local damage, which was very similar in kind and degree for both drugs. The skin over the site of inoculation was unaffected, but deep in the muscle, in a sharply delimited area, occurred necrosis, haemorrhage, oedema and inflammatory exudate, with involvement of nerves and vessels in the area. The degree of damage was proportional to the concentration of the drug and was most intense about the 12th day, being followed by repair with production of scar tissue. The author suggests that intramuscular injection of paludrine should, where possible, be avoided. *J. D. Fulton.*

HUTCHISON, W. C. & KERMACK, W. O. **Attempts to find New Antimalarials. Part XXV. Some Derivatives of 3:4:2′:3′—Pyridoacridine substituted in the 2-Position.** *J. Chem. Soc.* 1947, May, 678–81.

SOPER, F. L., KNIPE, F. W., CASINI, G., RIEHL, L. A. & RUBINO, A. **Reduction of Anopheles Density effected by the Pre-Season Spraying of Building Interiors with DDT in Kerosene, at Castel Volturno, Italy, in 1944-1945 and in the Tiber Delta in 1945.** *Amer. J. Trop. Med.* 1947, Mar., v. 27, No. 2, 177–200, 11 figs.

AITKEN [this *Bulletin*, 1947, v. 44, 800] has already described the effects of the use of DDT in the Castel Volturno district in Italy. His information is here repeated in brief, and followed by an account of a similar larger trial in the Tiber Delta. The object was to apply a single spray of DDT in the spring, before the mosquito- and malaria-season, to all anopheline shelters in an area where re-infestation from without would be minimal, and to study its effects and particularly their duration.

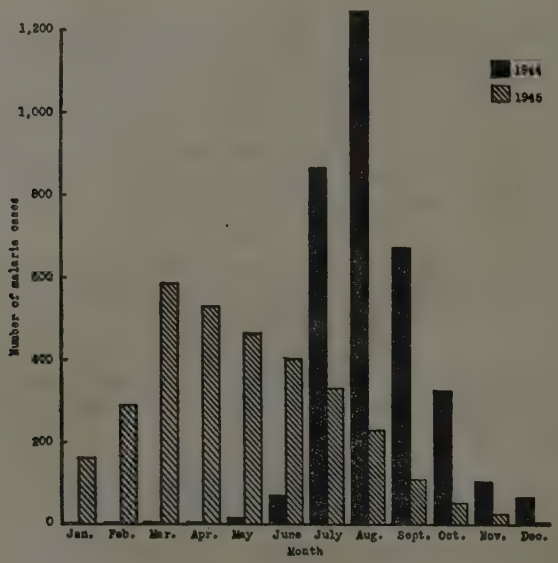
The area was a reclaimed swamp in the Tiber Delta, the drainage from which had been stopped by German authorities so that considerable reflooding had occurred, with profuse breeding of anophelines, particularly *Anopheles maculipennis* var. *labranchiae*. Records of malaria morbidity since 1936 were available for comparative purposes, together with some other data, such as monthly anopheline captures in one area since 1939, and spleen and parasite rates.

A 6·5 per cent. solution of DDT in kerosene was applied by knapsack sprayer to give a dose of 200 mgm. per sq. ft. (7 oz. per 1,000 sq. ft.) on the entire

interior surfaces of the walls and ceilings of every anopheline shelter which could be recognized; the work was done between 27th February and 15th June, and 49,951 rooms, including stables, pigstyes and chicken pens, were treated.

It was apparent from collections of larvae that breeding continued, though data are insufficient to say if it was reduced. Systematic searches for adult anophelines showed standard weekly catches mostly between 0·1 and 1·0 mosquitoes per "premises" in each section, compared with the previous records which varied between 100 and 500, a reduction which continued till the end of the observations in November. Any rise in the average anopheline catch was followed by a search for untreated shelters, which were examined and treated. A very small proportion of untreated shelters greatly affected the general picture; a newly constructed pigstye not only sheltered 300 mosquitoes, but served to raise the numbers in neighbouring treated places quite appreciably.

The incidence of malaria in the year before treatment, 1944, and the year under review is shown in the figure below. The quite different seasonal distribution in the two years is explained by the fact that the population had been




Cases of Malaria reported for the Tiber Delta in 1944 and 1945 by Month.

[Reproduced from the *American Journal of Tropical Medicine.*]

largely evacuated in the spring of 1944, returned in the summer, suffered a sharp outbreak of malaria, followed by a sharp spring outbreak in 1945 due to prolonged incubation periods and relapses, but without any new infections in that year. A continuous search was made for new cases, and one was found in an infant of three months old; the general picture is, however, one of a virtually complete absence of fresh infections. *G. Macdonald.*

EDDEY, L. G. **Destruction of Adult Mosquitoes by Residual DDT Methods.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1947, May, v. 40, No. 5, 567–88, 8 figs.

The author carried out three preliminary trials and two large-scale applications of DDT as a residual anopheline insecticide in houses on the Gold Coast, where the prevailing infestation is by *Anopheles gambiae* and *A. funestus*. The DDT was applied as a 1 per cent. solution in kerosene, at doses varying from 11·9 to 38·5 mgm. per sq. ft. of room surface (0·42 to 1·35 oz. per 1,000 sq. ft.) from knapsack sprayers, except in one instance where smaller hand sprays were utilized. Where possible, results were measured in terms of a "DDT index" or the anopheline count, as determined by spray killing, in treated quarters expressed as a proportion of that found in control untreated ones.

After 38·5 mgm./sq. ft. (1·35 oz. per 11,000 sq. ft.) the index remained between 0·1 and 0·2 for 9 weeks, after which it rose steadily. After 11·9 mgm./sq. ft. (0·42 oz. 1,000 sq. ft.) the rise started after 2 weeks, both when the application was made from a knapsack sprayer and when it was made from a "Maney" hand spray. In an extensive field application with 19·75 mgm./sq. ft. (0·7 oz. per 1,000 sq. ft.) the index remained below 0·2 for 20 weeks, below 0·4 for 29 and was still below 0·6 at 40 weeks.

In the final test at Takoradi, the computation of the index was not possible; there was, however, a marked reduction in the anopheline count compared with that previously found when pyrethrum spraying had been regularly carried out following the application of 19·3 mgm./sq. ft. (0·68 oz./1,000 sq. ft.). The author concludes that it was much more effective than the pyrethrum spraying previously reported [this *Bulletin*, 1945, v. 42, 255].

One gang, consisting of a recorder, a headman, and eight labourers using six sprayers, treated 206 township rooms daily, the cost for each room being—for labour, 1·25 pence, for kerosene, 6·05 pence, and for DDT, 2·13 pence, making a total of 9·43 pence per room per round, or 3·41 pence per head of population. The author estimates that such treatment would be needed every two and a half months. *G. Macdonald.*

HOCKING, K. S. **The Residual Action of DDT against** *Anopheles gambiae* **and** *funestus*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1947, May, v. 40, No. 5, 589–601.

Working in Taveta, Kenya, the author applied kerosene solutions of DDT at 50, 100 and 200 mgm./sq. ft. (1·8, 3·5 and 7·0 oz. per 1,000 sq. ft.) to the walls of tents, huts and traps, with a power-driven spray. The effect was usually checked by morning catches, first of dead mosquitoes on a sheet-covered floor, then of mosquitoes killed by pyrethrum spraying; in some cases, mosquitoes were caught alive and kept, to measure their time of survival. An effort was made to measure the extent to which mosquitoes were repelled from treated tents, by attaching to each tent an untreated one in which the emigrants might rest. The main species of mosquitoes concerned were *A. gambiae* and *A. funestus*.

In tents and huts, there was a marked drop in the number of mosquitoes after treatment; in tents, the lethal effect persisted for 12 months after 200 mgm./sq. ft. (7 oz./1,000 sq. ft.) and 6 months after 100 mgm.; on mud plaster, for 4 months after 100 mgm.; on compressed fibre board for 3 months after 200 mgm., 2 months after 100 mgm. Estimation of the numbers in traps and in annexes to treated tents led to the conclusions that there was no interference with the normal entry of mosquitoes into huts or with their biting habits; that they tend to leave the building after being in contact with DDT;

and that the mortality amongst mosquitoes which have been able to feed, and therefore tend to rest, is certainly very high and closely approaches 100 per cent. in completely treated rooms. Where there is no source of blood, or where there are alternative untreated surfaces on which to rest, a number escape.

Though all doses were in one sense effective, it is concluded that the optimal dose is 150 or 200 mgm./sq. ft. (5·3 or 7·0 oz./1,000 sq. ft.), but depends very much on the texture of the wall surface, the useful effect usually lasting 4 to 6 months. Recently applied limewash neutralized the DDT ; 100 mgm./sq. ft. applied 3 months after limewashing lasted only 1 month ; applied 1 month after such limewashing, it lasted for a negligible period only. *G. Macdonald.*

HESS, A. D. & KEENER, G. G., Jr. **The Effectiveness of DDT Residual House Sprays in controlling** *Anopheles quadrimaculatus.* *Amer. J. Hyg.* 1947, Mar., v. 45, No. 2, 133–43, 1 fig.

The special features of this work are that houses only were treated with DDT ; subsequent anopheline counts were made in houses and in untreated animal sheds and barns to detect any correlated reduction ; and the precipitin test was used to detect any changes in the feeding habits of the mosquitoes following DDT application.

*Anopheles quadrimaculatus* more frequently spends the day in barns (85 per cent.) than in houses (15 per cent.) ; of those caught in barns, 2·7 per cent. and of those caught in houses 5·5 per cent., last fed on human blood. Treatment of houses only with 200 mgm. DDT per sq. ft. (7 oz./1,000 sq. ft.) in the form of an emulsion of a strong oil solution, applied by either hand or power-operated sprayers, caused a virtual total disappearance of adult mosquitoes from the treated houses, but did not cause any reduction in the numbers in adjacent barns.

Before treatment, the percentage of mosquitoes containing human blood had been 5·5 and 2·7 in houses and barns respectively. After treatment, it could not be estimated in house-caught mosquitoes as they were too few in number. In those caught in barns, it dropped to 2·1 per cent. in the next week and remained low, though the decrease in individual barns varied very greatly. From a consideration of these data, the authors conclude that the reduction in the numbers of human-fed mosquitoes was about one-half. From this calculable fact, they draw the conclusions that the risk of transmission of malaria was decreased by an equal amount, that treatment of houses alone is inadequate, that the whole premises should be sprayed, and that if restriction in the number of premises to be sprayed is inevitable, barns should be treated in preference to houses. [The conclusion that the reduction in the transmission of malaria is even roughly equivalent to the reduction in the numbers of human-fed mosquitoes does not seem valid to the reviewer, as it could be hypothecated that the conditions of the test would greatly increase the proportion of young and therefore uninfected mosquitoes. Since this cannot be estimated directly, it seems more appropriate to use the sporozoite rate as a direct measure of the effect produced.] *G. Macdonald.*

GAHAN, J. B. & PAYNE, G. C. **Control of** *Anopheles pseudopunctipennis* **in Mexico with DDT Residual Sprays applied in Buildings.** *Amer. J. Hyg.* 1947, Mar., v. 45, No. 2, 123–32.

The authors' object in undertaking the work here described was to measure the effect of DDT residual spray treatment in the control of malaria, not merely in the control or apparent control of anophelines, and also its effect on another

species of anopheline not previously the subject of enquiry of this kind. This paper constitutes an interim report which deals only with the control of *Anopheles pseudopunctipennis.*

Work was done in the State of Morelos, in Mexico, in four villages, two test and two control, infested by *A. pseudopunctipennis* breeding in rice fields; a recorded history of malaria in recent years was utilized for comparative purposes. In the test villages, a 5 per cent. DDT/oil/water emulsion was applied in April and May to all shelters, at average concentrations of 212 and 190 mgm. per sq. ft. (7½ oz. and 6·7 oz. per 1,000 sq. ft.) by means of a hand-operated wheelbarrow spray. The reduction of anopheline adults in each of the two test villages amounted to over 99 per cent. and persisted until the end of the observation period in October. There was a concomitant marked reduction in the numbers of larvae, estimated conservatively at 85 per cent. and more generously at 94 per cent. in neighbouring rice fields; this was attributed to reduction in the number of ovipositing females, which was most marked in May and June and had come to an end by October. The reduction was, however, greatest in the case of small larvae presumably because a higher proportion survived to maturity in the less crowded water, so that the proportion emerging as adults was probably reduced by 68 per cent. only. *G. Macdonald.*

BRESCIA, F. **Salt Marsh and Anopheline Mosquito Control by Ground Dispersal of DDT Aerosols.** *J. Econom. Entom.* 1946, Dec., v. 39, No. 6, 698–715, 3 figs.

Details of numerous field experiments with DDT aerosols are recorded in this paper. The work was performed in Florida and Alabama against natural free populations of adult mosquitoes and larvae and against adults in cages and kegs and larvae in pans.

The chief mosquitoes were *Aëdes sollicitans* and *Aëdes taeniorhynchus*, but *Anopheles atropos* and *Psorophora ciliata* were also observed. In addition some tests were made in the Tennessee Valley swamp area against *Anopheles quadrimaculatus*. The aerosols were formed of equal quantities of oil, containing 10 per cent. dissolved DDT, and water; details of the generator will be published later.

Suitable meteorological conditions for this method of control were found to be a stable atmosphere, with the air temperature near the ground lower than that of the upper layers and a wind velocity of not less than 2 miles per hour; though with a 10-micron diameter aerosol, a dosage of 15 gallons per 1,000 foot frontage killed adults up to a mile down wind, regardless of wind velocity and terrain. For larval control, however, though this dosage killed larvae up to 2,000 feet in open country and from 500 to 1,000 feet in forest land, the particle size had to be increased when the wind velocity was 3 miles per hour or more, except in forest where the 10-micron particle had to be used to ensure penetration. With this output, residual effect was negligible; but a local deposit of 0·002 lb. DDT per acre killed 50 per cent. larvae of *Aëdes sollicitans* and *Aëdes taeniorhynchus* in 18 hours and 0·001 lb. DDT per acre killed nearly 100 per cent. larvae of *Anopheles quadrimaculatus* within 12 hours. *H. S. Leeson.*

HURLBUT, H. S., MAPLE, J. D., WILSON, C. S., FALLANDER, S. R. & HUSMAN, C. N. **Observations on the Dispersal of DDT from Aircraft for the Control of Mosquitoes.** *U.S. Nav. Med. Bull.* 1947, Mar.–Apr., v. 47, No. 2, 368–79, 2 figs.

War conditions often demand the immediate and virtually total destruction of the mosquito population in dense forest, though the need for this is less

likely to be common in peace. This paper describes four tests carried out in Guadalcanal and Guam, three for the control of adult mosquitoes and one for larval control. In them, a 10 per cent. solution of DDT in a mixture of cyclohexanone and mineral oil was sprayed from aircraft at a dose of 0·4 lb. DDT per acre for adult control and 0·2 lb. DDT per acre for larval control. The number of drops per square inch, and the reduction in adult and larval mosquitoes was recorded. The adult mosquitoes biting were reduced by 98 per cent. and the number of larvae by 99 per cent. It appears that a dose of 50 droplets per square inch is adequate for adult destruction (actual counts varied from 12 to 540) and droplets of less than 100 microns in diameter penetrated forest cover better than did larger ones. *G. Macdonald.*

ELMENDORF, J. E., Jr., assisted in Field and Laboratory Operations by K. G. BARNHILL & M. TAKOS. **Preliminary Report on Field Experiments to demonstrate Effectiveness of various Methods of Malaria Control.** *Amer. J. Trop. Med.* 1947, Mar., v. 27, No. 2, 135–45.

On the Atlantic Coast of tropical America, where malaria is endemic and carried by *Anopheles albimanus*, five towns were chosen for the comparative testing of malaria control measures in 1946 after surveys of the incidence of malaria had been made in the previous year. Control work actually started in December 1945, and the report covers the period up to 3rd April, 1946 only, a time which does not include the transmission season of May to December.

The control procedures in the towns were (*a*) weekly dosage of SN 7618 on a basis of 0·3 gm. weekly for an adult, which reduced the parasite rate from 33 per cent. to 6 per cent., (*b*) application of a 5 per cent. solution of DDT at doses of 300 to 400 mgm./sq. ft. (10·6 to 14 oz./1,000 sq. ft.) as a residual anopheline insecticide, (*c*) application of 5 per cent. solution of DDT as a larvicide from aircraft, and (*d*) the use of drug 8137 as a prophylactic.

As the report does not cover the transmission period, it is not surprising that no significant reduction in incidence was produced by methods (*b*) and (*c*). Method (*d*) had not been started at the time of closure of the report.

The paper will be of interest as a background to a later report.

*G. Macdonald.*

GARNHAM, P. C. C. **Exoerythrocytic Schizogony in *Plasmodium kochi* Laveran. A Preliminary Note.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1947, May, v. 40, No. 5, 719–22.

In a post-mortem search of the organs of 16 monkeys (*Cercopithecus*) showing *Plasmodium kochi* in the peripheral blood, the author, working in Kenya, found characteristic changes in the livers of 15.

These changes took the form of multiple white or translucent spots, more commonly on the surface of the organ: in diameter they reached a maximum of 2 mm. The translucent forms are cystic, and the fluid contains minute flakes, which are in fact developmental forms of the parasite. Smears from these merocysts showed both merozoites and schizonts: the appearance and development of these are described. There is no pigment and the parasites do not appear to be within any cells of the host's tissues. Serial sections of these liver lesions made it possible to recognize three stages of development, which the author tentatively classifies as follows: (1) cytomere formation, (2) mature merocyst, (3) degeneration of the parasite, varying with the local tissue reaction. These stages are described; the first stage in general closely resembles the development of *Haemoproteus* in the organs of the Bagdad sparrow.

The local tissue reaction begins with a polymorph invasion, which may result in complete response : if, however, the parasite survives, these are replaced by a layer of fibroblasts and giant cells ; little of the cellular reaction remains around the mature cyst. It is suggested that each focus of cytomeres is produced by the multiplication of a sporozoite or merozoite : it seems likely that the merozoites of the mature cyst, being in close contact with liver tissue, escape into the circulation and become gametocytes.

The author bases his belief that the liver foci are part of the cycle of *P. kochi* on the following grounds : (1) the only schizonts found in blood smears of heavily infected animals were of the *gallinaceum* type : in sections, cytomeres strongly resembling *Haemoproteus* were found, (2) no other blood protozoa were found in the monkeys, except a *Babesia* in one case, (3) the merocysts did not significantly resemble fungi and did not grow on Sabouraud's medium, (4) 7 monkeys which were repeatedly negative for malaria did not show the liver lesions described.

Efforts to confirm the identity of the parasite by transmission experiments have failed so far : but a slightly suggestive result was obtained by giving paludrine to an infected monkey in whose liver two spots had been detected at experimental operation : after 4 days of paludrine, the animal died and at autopsy, only one tiny spot was found.

The author found the parasite in 6 species of *Cercopithecus* in Kenya : in general it conforms closely with the original descriptions of *P. kochi* Laveran and with strains from West Africa, examined by the author in preparations provided by Dr. Hawking.

The author notes that the type of schizogony seen is more akin to that of *Haemoproteus* than *Plasmodium* ; but he considers that *kochi* should not be removed to the latter genus, which comprises parasites of non-mammalian nucleated blood with "*Halteridium*" gametocytes ; and in any case, the later cystic stages which he has described are quite unlike anything hitherto described in the Haemosporidiidae.

Reference is made to the observation of LEVADITI and SCHOEN (*C. R. Soc. Biol.*, 1932, v. 109, 343) who described such liver bodies in a baboon ; but they did not associate them with malaria and gave them the name *Hepatocystes simiae.* *H. J. O'D. Burke-Gaffney.*

RIGDON, R. H. & ROSTORFER, H. H. **Effect of Oxygen on** *P. lophurae* **Infected Ducks.** *Proc. Soc. Exper. Biol. & Med.* 1946, Oct., v. 63, No. 1, 165–7.

RIGDON, R. H. & ROSTORFER, H. H. **Blood Oxygen in Ducks with Malaria.** *J. National Malaria Soc.* 1946, Dec., v. 5, No. 4, 253–62, 5 figs.

"1. The oxygen capacity of the blood is greatly reduced during *P. lophurae* infection in the duck. At the time of death, the blood may have only 20 per cent. of the normal oxygen capacity.

"2. During the course of the malarial infection in the duck a severe acidosis develops which also reduces the efficiency of the blood as an oxygen transporting medium.

"3. The young cells are not efficient oxygen carriers in comparison to normal adult red cells.

"4. Death of birds infected with *P. lophurae* is caused by failure of the blood to carry a sufficient amount of oxygen to support life."

RIGDON, R. H. **Effect of Vitamin A Deficiency on** *Plasmodium lophurae* **Infection in Ducks.** *J. Infect. Dis.* 1946, Nov.–Dec., v. 79, No. 3, 272–7, 3 figs.

"There is no evidence from this study to show that a vitamin A deficiency in ducks influences either the time that the peak of infection is reached or the degree of parasitemia produced by *Plasmodium lophurae*. This deficiency does not affect significantly the susceptibility of the duck to this infection as indicated by the degree of parasitemia at the time of death."

RIGDON, R. H. & MARVIN, H. N. **Effect of Insulin on** *Plasmodium lophurae* **Infection in Ducks.** *Amer. J. Hyg.* 1947, Mar., v. 45, No. 2, 185–90, 3 figs. [15 refs.]

"White Pekin ducks infected with *P. lophurae* do not show any significant differences in the course of the parasitemia when given enough insulin to produce a severe hypoglycemia and blindness, as compared to noninsulin-treated malarial infected ducks.

"The rapid decrease in the number of parasites which occurs immediately following the peak of parasitemia apparently cannot be attributed to hypoglycemia.

"In this experiment 30 per cent. of the ducks with malaria died; 40 per cent. of those given only insulin died, while 90 per cent. of those given both malaria plasmodia and insulin died. It appears that the effects of hypoglycemia produced by both the insulin and a high degree of parasitemia are additive in producing death."

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## BLACKWATER FEVER.

FINDLAY, G. M. & MARKSON, J. L. **Attempts to induce Blackwater Fever experimentally.** *Ann. Trop. Med. & Parasit.* 1947, May, v. 41, No. 1, 22–5.

It has been suggested that blackwater fever is due to sensitization, an autoantigen being produced by the action of the malaria parasite, or parasite plus anti-malarial drug, on the red cell. This autoantigen gives rise to an autoantibody haemolysin which, reacting with red cells in the presence of complement, causes haemolysis. In support of this theory it is remarked that European troops rarely developed blackwater fever during the first nine months of residence in W. Africa, this period presumably being necessary for sensitization. Among African troops, the incidence of blackwater fever was low in 1941 and 1942 but gradually rose in 1943, 1944 and 1945, although in African civilians the incidence of the disease showed no similar rise. The only difference between the African soldiers and civilians was that the former had been put under conditions where the chance of being bitten with infected anophelines was reduced. It is suggested that by this means the soldiers to some extent lost their immunity to malaria, and that subsequent incidental infections resulted in a rise in the incidence of blackwater fever, since these infections were with the same strains as those with which the soldiers had originally been infected. In the subsequent infections the strains reacted therefore as specific allergens. African troops transferred to India, although similarly removed from the chance of being reinfected with W. African strains, did not show a similar rise in the incidence of blackwater fever since their reinfections were with different strains of parasites. Slightly suggestive evidence in support of the hypothesis was obtained by experiments on patients convalescent from blackwater fever; injections of

normal blood into such patients produced no reaction ; but injections of blood from patients suffering from malaria caused by the local strain of parasites produced haemolysis in three out of six patients convalescing from their first attack of blackwater fever, while similar injections of the infected blood produced no haemolysis in normal persons. *F. Murgatroyd.*

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## TRYPANOSOMIASIS.

VAN DEN BERGHE, L. Sur la présence d'acide pentosenucléique sous forme de grains de " volutine " dans les trypanosomes. [**The Presence of Pentosenucleic Acid in the Form of Grains of " Volutin " in Trypanosomes.**] *Acta Biol. Belgica.* 1942, v. 2, No. 4, 464–7, 2 figs.

PIERRON, A. Note sur le traitement de la trypanosomiase par injections intraveineuses d'arséniate d'argent. [**The Treatment of Trypanosomiasis by Intravenous Injections of Silver Arsenate.**] *C. R. Acad. Sci.* 1947, Jan. 13, v. 224, No. 2, 163–4.

The author, in Gabon, claims remarkable success with the use of silver arsenate given intravenously in cases of trypanosomiasis.

Claims of success include disappearance of parasites and symptoms, absence of intolerance to the drug, efficacy in arsenic-resistant cases, value in both early and central nervous infections and very small dosage.

However, the type of infection treated, the number of cases and the exact dosage of the drug are not stated, other than that the doses were nearly 100 times weaker than the usual trypanocides, so that this note is of little practical value until further information is forthcoming. *H. J. O'D. Burke-Gaffney.*

IKEJIANI, O. **The Antigenic Composition and the Effect of various Extracts of** *Trypanosoma equiperdum* **and** *Trypanosoma lewisi* **on the Leucocyte Picture in Experimental Trypanosomiasis.** *Amer. J. Hyg.* 1947, Mar., v. 45, No. 2, 144–9.

NICOLLE, P. & LWOFF, Marguerite. A propos de l'action protérogène de l'amide nicotinique sur l'exuviation de *Triatoma infestans* Klug (Réduvidé hémophage). [**The Accelerating Action of Nicotinamide on the Moulting of** *Triatoma infestans.*] *C. R. Acad. Sci.* 1947, July 16, v. 225, No. 2, 147–8.

LATIF, N. **Therapeutically Active Stilbenes.** *J. Roy. Egyptian Med. Ass.* 1947, May, v. 30, No. 5, 247–55. [17 refs.]

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## LEISHMANIASIS.

KIRK, R. & SATI, M. H. **Observations on the Use of Sodium Antimony Gluconate (Sodium Stibogluconate) in the Treatment of Kala-Azar.** *Ann. Trop. Med. & Parasit.* 1947, May, v. 41, No. 1, 14–21. [10 refs.]

In three series of cases of kala azar, all but two of the patients being in the Gedaref Civil Hospital, Sudan, treatment was given with sodium antimony gluconate (sodium stibogluconate), which is apparently identical with the Bayer preparation " solustibosan ". The cases were unselected and presented

all degrees of severity. In every case the diagnosis was confirmed parasitologically. The drug was given intravenously each day and the criteria of presumptive cure were those previously adopted by the authors [this *Bulletin*, 1941, v. 38, 260].

In the first series, the usual solution (75 mgm. of drug=20 mgm. of Sb per ml.) was used, one ampoule of 6 ml. being given daily. Irrespective of age (three were children 4, 7 and 7 years), an average of 30 injections (20–40) was given to those who completed the course. Four patients, of whom two were in a hopeless condition on admission, died, and 8 were apparently cured: most of these were followed-up for nearly 2 years.

In the second series, the same individual doses, and the same average total dosage, were given, but in some cases more than one dose was given daily: in three cases, 4 injections were given at 4 hours intervals. In this series, one patient died (pneumonia) and nine were apparently cured; the follow-up period was shorter, being over 6 months in only 3 cases.

In the third series, a concentrated solution (100 mgm. of Sb to 1 ml.) was used but the same amount (6 ml.) was given. However, only 6 to 10 doses (mean 6·84) were given, so that the total dosage was only slightly higher than in the first two series. Usually, the first four doses were given on consecutive days and then after a lapse of two weeks, two or more further doses, but in two cases the full course was given in six days. In this series, 13 patients were cured and one died. The particular feature in this group was that there was usually an immediate clinical response to the drug and that, in most instances, gland and spleen punctures were negative after the first four injections.

Although the dosage in the third series was very slightly higher than that in the other two, the better results can almost certainly be attributed to the time-concentration factor.

The authors feel [rightly] that this is a distinct advance in the treatment of kala azar in the Sudan. Further, there are great practical advantages in being able to complete a course of specific treatment in as short a time as six days.

The toxic effects of this drug are almost negligible, but it was noted that of the six patients who died three died of pneumonia. *L. E. Napier.*

MAEGRAITH, B., BRUNDRETT, J. C., RIGBY, J. D. & SLADDEN, R. A. **Sodium Stibogluconate in the Treatment of Kala-Azar: Report on the Treatment of Eight Cases and the Appearance of probable Drug Reactions.** *Ann. Trop. Med. & Parasit.* 1947, May, v. 41, No. 1, 118–28, 3 charts.

Eight patients with kala azar were treated in Liverpool by sodium stibogluconate given intravenously. Four patients had apparently acquired their infection in India and four in the Mediterranean endemic areas. Five were English, one Italian, one Indian and one a negro. The duration of the disease was 8, 7, 6, 5, 3, 3, 1, and ¼ months respectively. The diagnosis was in every case confirmed parasitologically. The original intention was to give 12 ml. of the 20-mgm. (Sb)-per-ml. solution of the drug twice daily for 10 days, a total of 240 ml. (=4·80 gm. Sb). This dosage was actually followed in only three cases: a fourth patient had the same total dose differently spaced. In the other cured cases, a smaller number of injections was given and the patient who died received only 12 injections. Cure was apparently complete in seven cases and one patient died. The cure was confirmed parasitologically 3 to 4 months later in five cases: in the others there was good clinical evidence of recovery, but the seventh patient (the Indian) was not traced.

The special interest of this series is the severe reactions that occurred in five of the eight cases. Half an hour after the 10th to 14th dose of the drug, a sharp rigor developed, the temperature rose to 105°F. or so, there was severe

abdominal pain especially over the liver, and in some cases vomiting or diarrhoea or both. Recovery was usually rapid, but the negro patient became shocked and cyanosed and died 21 hours after the last dose. In two of the other cases, treatment was later resumed and no further reactions occurred. There was no relation between the severity of the case and the reactions; it was therefore considered that they were caused by the drug. It was not a defect in the batch of drug, because others treated with the same batch showed no reactions. It is unlikely that it was an anaphylactic phenomenon as injections were being given twice daily. Analysis of the organs in the fatal case do not suggest that death was due to accumulation of the drug. A detailed post-mortem examination was carried out and is reported. No indication of the cause of the circulatory failure, to which death was attributed, was given. The patient also had an amoebic ulcer of the colon. In the liver there were degenerative changes in the parenchyma cells amounting to necrosis in some areas, especially in the central portions of the lobules. *L. E. Napier.*

HARRIS, J. O. **Attempts to find New Chemotherapeutic Amidines. Part VII.** *J. Chem. Soc.* 1947, May, 690–92.

ANSARI, N. Action de diverses préparations dénommées "Vitamine $B_1$" sur les cultures de *Leishmania tropica.* [**Action of Different Vitamin $B_1$ Preparations in Cultures of** *Leishmania tropica.*] *Arch. Inst. d'Hessarek.* Teheran. 1947, May, No. 5, 78–9.

The author studied the effects on the growth of *Leishmania tropica* in NNN medium of two commercial preparations of vitamin $B_1$, which he has called "A" and "B": both were aqueous solutions of aneurine [thiamin] hydrochloride. Preparation A contained 10 mgm. per cc., and preparation B, which was "extra strong", contained 50 mgm. per cc.

These products were added to the water of condensation in 12 cc. of NNN medium, either unheated or heated to 100°C. for 30 minutes. The results, which are shown in a table in the text, indicate that preparation A in active form prevented the growth of leishmania in 5-day cultures at a strength of 0·2 mgm. per tube or more: the inactivated product completely inhibited growth at as little as 0·1 mgm. per tube. In the case of active preparation B, growth was stimulated in proportion to the quantity added: the inactivated product inhibited growth, but to a lesser extent than in the case of preparation A, since 0·5 mgm. was required to produce this effect.

The author concludes that the two products act according as they contain a thermolabile stimulating substance and a thermostable inhibiting substance, in unequal proportions, the former being Vitamin $B_1$. In preparation A, the inhibitor is present in greater amount, and in preparation B, the stimulator preponderates. For these studies, it is added, pure products—not those for medical use—should be employed. *H. J. O'D. Burke-Gaffney.*

DOLMATOVA, A. V. [**Observations on the Biology of Sandflies in a Focus of Cutaneous Leishmaniasis.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 4, 75–85, 2 charts. [11 refs.] [In Russian.]

As a preliminary step in the study of the epidemiology of cutaneous leishmaniasis in Leninabad, representing one of the foci of this disease in Tadjikistan, the author made a study of the bionomics of the sandflies in this district. Among 6,086 specimens examined the following six species were represented:

*Phlebotomus papatasi*, *P. sergenti*, *P. caucasicus*, *P. chinensis*, *P. sergenti* var. *alexandrii* and *P. graecovi*. The biotopes of sandflies sometimes serve both as breeding places and as habitats of the adult insects, and sometimes only for some part of their life-cycle. By means of the precipitin reaction it was shown that *P. papatasi*, *P. sergenti*, *P. caucasicus* and *P. chinensis* have no special food-preferences, but feed on the blood of those animals which are more prevalent in a given locality and are more accessible to their bites. These sandflies are characterized by gonotrophic harmony, *i.e.* they require a single blood meal for the maturation of one batch of ova. From 30 to 36·6 per cent. of the females pass through repeated gonotrophic cycles, thus providing favourable conditions for the transmission of leishmaniasis by these species of sandflies.

*C. A. Hoare.*

LEVINSON, L. B. & SKADOVSKAJA, N. S. [**On the Histopathology of Cutaneous Leishmaniasis.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 5, 73–81, 9 figs. [In Russian.]

This paper is devoted to a study of the pathogenesis of experimental cutaneous leishmaniasis and deals, on the one hand, with the behaviour of the parasites at various stages of the disease, and, on the other hand, with the reactions of the host's tissues to the infection. A culture of *Leishmania tropica* from a human ulcer of the "moist" type [this *Bulletin*, 1944, v. 41, 331] was inoculated subcutaneously into the ears of mice, and portions of the ear, removed at different stages of development of the sore, were fixed and examined in paraffin sections and stained by various methods. After having been introduced into the skin, the leishmanias at first multiply intensely outside the host's cells. The host's organism responds by the usual inflammatory reaction. By diapedesis, enormous numbers of neutrophil leucocytes migrate into the tissues, followed later by lymphocytes and monocytes, and by histiocytes from the surrounding connective tissue. The histiocytes are transformed into macrophages which engulf the parasites, and these continue to multiply intracellularly. In addition to the macrophages, the leishmanias may invade a variety of other cells, such as neutrophils, lymphocytes, epithelial, as well as muscle and cartilage cells. The host cells are lysed by the parasites, which probably secrete a special exotoxin. During the infiltration stage (3–4 weeks after inoculation), the centre of the sore consists of disintegrated masses of tissues and free leishmania, while along the periphery they are intracellular. The leishmanias then begin to spread through the derma, their penetration being effected in different ways: through the lymph ducts, by lysis of the tissues and invasion of its healthy parts, and by the macrophages which pick up the parasites in the infiltration area and carry them to the periphery.

In the nodular stage (2–3 months after inoculation) the host's tissues undergo more extensive lysis, the parasites penetrate into the epithelium of the skin, destroying the basement-membrane, as a result of which the entire epidermis disintegrates, exposing the connective tissue and giving rise to an ulcer (4–4½ months after inoculation). In the nodular stage, the majority of the parasites are extracellular and the phagocytes are apparently unable to cope with them. In the ulcerating stage, antibodies appear on the scene, bringing about degeneration of the extracellular parasites on a large scale. Since phagocytosis of the parasites is rarely observed, it is thought that it does not play any special rôle, the defence mechanism of the host depending chiefly on humoral factors. While the parasites are being destroyed, there is an increase in the number of fibroblasts and a gradual formation of scar tissue. The mutual relations between the parasites and elements of the host's tissues are clearly shown in the figures illustrating this paper. *C. A. Hoare.*

SAGHER, F. **Leishmania Vaccine Test in Leishmaniasis of the Skin (Oriental Sore). Quantitative Experiments.** *Arch. Dermat. & Syph.* 1947, May, v. 55, No. 5, 658–63, 1 chart.

It has been observed that, although the reaction to the intradermal injection of a leishmania vaccine is, generally speaking, specific, the reaction varies in intensity and is occasionally negative in a definite case of oriental sore. The author has therefore carried out a series of tests with graded dilutions of vaccine in a number of cases of oriental sore of various types.

His cases have been placed into three groups :—

(1) Leishmaniasis nodosa : duration of infection less than one year : histologically—chronic non-specific inflammation.

(2) Leishmaniasis recidiva [see DOSTROVSKY, this *Bulletin*, 1935, v. 32, 89] : duration of infection more than one year : histologically " tuberculoid granulation ".

(3) Transition forms : over one year's duration.

The full-strength vaccine, made according to Dostrovsky's method [this *Bulletin*, 1936, v. 33, 21] contained 1,000,000 leishmaniae per ml. It was used at full strength and in dilutions from 1 in 10 to 1 in 10,000,000. Thus, 0·1 ml. of the first dilution contained 10,000 leishmaniae, and 0·1 ml. of the last two only a fraction of 1 leishmania. The serial dilutions were injected intradermally and observed from 48 hours to a week later. Control injections with tuberculin and simple 0·5 per cent. solution of phenol were also given. A positive reaction varied in diameter from 5 to 15 mm.

The test was carried out in 84 cases of oriental sore and in 72 controls, mostly patients with other skin diseases. It was possible to follow the results in only 62 cases of oriental sore.

In 38 cases of leishmaniasis nodosa there was a positive reaction at moderate dilutions (1 in 100 to 1 in 10,000) in 34, and 4 showed a higher sensitivity (to 1 in 100,000 to 1 in 1,000,000). In 20 cases of leishmaniasis recidiva, there was a negative reaction in one and a low reaction (to undiluted or 1 in 10 vaccine) in 3, a moderate response in 5, and a high degree of sensitivity (including a reaction to 1 in 10,000,000 in 2 cases) in 11. The 4 transition forms all showed a high degree of sensitivity.

It was thus concluded that the recurrent types of leishmaniasis have " a more pronounced allergic component."

There was no parallelism between the number and severity of the lesions and the intradermal reactions. *L. E. Napier.*

PIERS, F. **Mucocutaneous Leishmaniasis in Kenya (with a Note on Penicillin Treatment).** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1947, May, v. 40, No. 5, 713–18, 2 figs. on 1 pl. [23 refs.]

Leishmaniasis was rare in East Africa before the war. African troops engaged in Abyssinia often contracted kala azar [this *Bulletin*, 1942, v. 39, 608, 746 ; *ibid.*, 1944, v. 41, 17, 831], and cutaneous types of leishmaniasis were also observed [*ibid.*, 1943, v. 40, 229 ; 1944, v. 41, 831]. In Kenya, the Northern Frontier District was the only recognized endemic area of leishmaniasis. In the case now reported and in five cases of kala azar as well as in two cases reported by WRIGHT [*East African Med. J.*, 1943, v. 20, 19] the infection appears to have been contracted in Central Kenya in the Kamba reserve near Kitui. It seems uncertain whether a new focus of infection has appeared south of the Equator or whether an old focus is now being recognized for the first time. If the former is the case, it is easy to understand how the movements of troops during the war might have been responsible.

The patient was a male Mkamba aged 35. He was in a poor state of nutrition but there was no evidence of systemic infection: neither spleen nor liver was enlarged. He was disfigured by a diffuse swelling of the upper lip and nose. The skin was deeply infiltrated and showed erosions, from which there was a sero-purulent discharge. A polypus-like mass protruded from and distended the right nostril. The mucous membrane of the nose was swollen, partly eroded and bled easily. The mucous membranes of the mouth and pharynx were not involved and there was only slight glandular enlargement.

Smears from the surface showed only polynuclear cells and cocci; but in the puncture material, macrophages crowded with leishmania were found. Sternal puncture showed no abnormality and the blood count was materially normal.

A biopsy from the right side of the upper lip showed the following:—

"The epidermis is covered by loose parakeratotic masses, the spaces between which are filled by fibrin and contain many polynuclear cells.

"The rete Malpighii shows marked intercellular (spongiosis) and intracellular oedema, and is in most places reduced to five to six layers of cells. The rete pegs are flattened out, but in some places irregular epithelial proliferation into the corium is notable (acanthosis). Polynuclear leucocytes are frequently encountered in the intercellular spaces. In one instance a large macrophage cell containing numerous leishmania is seen lying in the epidermis.

"The corium is completely replaced by a diffuse granulation tissue rich in cells, and without any signs of tuberculoid structure. It consists mainly of histiocytes, macrophages, plasma cells and round cells; polynuclear cells are rare. The histiocytes, particularly near the epidermis, are packed with enormous masses of leishmania. There are many apparently newly formed capillaries within the granuloma; in some of the larger vessels of the deeper layers of the corium endothelial proliferation is seen.

"The appendages of the skin are in an advanced state of disintegration. Fragments of hair follicles, sebaceous glands and coil glands are found in the depths of the corium; they seem to be no longer connected with the epidermis. The tissue around these residues contains sometimes giant cells of the Langerhans type."

Penicillin (400,000 units in five days) produced a distinct but not dramatic improvement. Later, urea stibamine was given intravenously in doses of 0·1 gm. at intervals of 3 days [unusually small doses] for an unstated period. Some further improvement was effected, but the patient decided to leave the hospital. *L. E. Napier.*

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## FEVERS OF THE TYPHUS GROUP.

SIEVERS, O. **The Weil-Felix Reaction in Typhus Fever.** *Acta Path. et Microb. Scandinavica.* 1945, v. 22, No. 3, 238–47. [17 refs.]

The author describes the results obtained in a large series of Weil-Felix tests in which suspensions of living *Proteus OX19* were used after incubation for two hours at 37°C. and standing overnight at room temperature. He suggests the desirability of adopting an internationally agreed standardized technique.

His results from 1,172 tests of sera from 292 typhus patients corresponded generally with those obtained by other workers.

In tests carried out on sera of 1,903 patients whose blood had been sent for the Widal test from places where there was no possible contact with typhus

patients he found the following positive reactions :—97 at 1–80 ; 25 at 1–160 ; 7 at 1–320 ; and 5 at 1–640 to 1–5,120. He emphasizes the necessity for carrying out simultaneous salmonella-agglutination tests in view of the strong co-agglutination reactions that may occur in such cases and for repeated Weil-Felix tests in all cases.

The survey of these and other findings "supports the reliability of the proteus reaction." *John W. D. Megaw.*

GIROUD, P. & JADIN, J. Phases maxima des anticorps spécifiques au cours d'une rickettsiose déterminée. [**Phases of Maximum Activity of Specific Antibodies in the Course of Experimental Rickettsial Infection.**] *C.R. Soc. Biol.* 1947, Mar., v. 141, Nos. 5/6, 235–7.

Using strains of epidemic- and murine-typhus rickettsiae as antigens in the rickettsia-agglutination test, the authors found that in undoubted cases of epidemic typhus the agglutination titre of the serum might at one stage of the infection be the same, or almost the same, with both antigens, whereas at a later stage the epidemic titre became much higher than the murine.

With the use of rabbits inoculated by the intraperitoneal route with large doses of epidemic and murine rickettsiae and their toxins, it was found that the agglutination titres with homologous antigens were much higher than those with the heterologous on the third day ; on the sixth day, the titres were much the same, and by the ninth day the homologous titres again became much higher than the heterologous.

The authors conclude that during an attack of typhus fever the antibodies have a non-specific phase, which is preceded and followed by a specific phase ; they regard the early stage of the illness and the stage following defervescence as the most favourable for carrying out the agglutination test.

*John W. D. Megaw.*

STEINER, F. Hautproben mit Fleckfieberimpfstoffen. [**Dermal Tests with Typhus Vaccines.**] *Klin. Woch.* 1944, July, v. 23, Nos. 27/30, 277–8.

The author confirms the conclusion reached by Bischoff that positive local reactions occurring after intradermal injections of Weigl's vaccine into persons who had previously been vaccinated with the same type of vaccine may be due to supersensitiveness to the albumins derived from the bodies of the lice used in preparing the vaccine. [See this *Bulletin*, 1945, v. 42, 198.]

Among 36 persons who had been vaccinated with Weigl's vaccine, only two gave completely negative reactions when the test was carried out with the same vaccine. On the other hand, among 48 persons who had been vaccinated in the same way, 26 were completely negative to injections of a yolk-sac vaccine made by the Behring firm.

The value of the test in diagnosis is regarded as unproved.

*John W. D. Megaw.*

VON BORMANN, F. & PREUSS, H. Eine Schnellmethode zur Fleckfieberdiagnose. [**A Rapid Test for Typhus Fever.**] *Klin. Woch.* 1944, July, v. 23, Nos. 27/30, 276–7.

Yet another of the rapid slide tests, of interest only to those experimenting with such tests. *John W. D. Megaw.*

MENYASZ, E. & NICOLAS, E. Valeur clinique du changement colorique de l'éruption au cours de l'évolution du typhus exanthématique. [**The Clinical Significance of Changes in the Colour of the Eruption during Attacks of Exanthematic Typhus.**] *Riv. Istituto Sieroterap. Ital.* Sez. Prima. 1947, Apr.–June, v. 23, No. 2, 81–9. English summary.

The authors made a special study of the eruption occurring in typhus patients during a severe epidemic in a German concentration camp in Bavaria. The fatality rate was 40 per cent. ; all the patients had been greatly debilitated by starvation and fatigue before the onset.

When purpuric or ecchymotic spots became darker in colour and more numerous it was found that after an interval of one or two days the condition of the patients greatly deteriorated or dangerous complications occurred. These changes in the rash were of great significance from the point of view of prognosis ; they occurred either during the febrile stage or after defervescence.

*John W. D. Megaw.*

HAAGN, E. Bemerkungen zu dem Aufsatz "Beobachtungen an 244 Fleckfieberfällen." (Dr. V. Lachnit in Nr. 18/19.) [**Remarks on Lachnit's Paper "A Study of 244 Cases of Typhus Fever."**] *Wien. med. Woch.* 1947, July 19, v. 97, Nos. 28/29, 329.

The author bases his remarks on a study of 38 cases of typhus fever, of which five were fatal, seen between November 1941 and February 1942. [See this *Bulletin*, 1947, v. 44, 704.]

Two of the patients had been inoculated with Weigl's vaccine during the incubation period ; one of these died, the other had a very severe attack, from which he recovered only because of his youth and previous fitness.

A firm belief is expressed in the value of full doses of strophanthin early in the illness, and also of calcium given intravenously as soon as possible after the onset. It is stated that after the latter line of treatment was adopted, no further deaths occurred, but the number of cases so treated is not mentioned.

*John W. D. Megaw.*

SOPER, F. L., DAVIS, W. A., MARKHAM, F. S. & RIEHL, L. A. **Typhus Fever in Italy, 1943-1945, and its Control with Louse Powder.** *Amer. J. Hyg.* 1947, May, v. 45, No. 3, 305–34, 16 figs. (8 on 4 pls.)

Although this paper deals only with one epidemic it can rightly be regarded as a monograph on the modern method of control of louse-borne infections by insecticide powders.

The authors were members of the typhus team of the Rockefeller Foundation Health Commission, which played a leading part in the disinfesting operations in and round Naples from December 9th, 1943, when the epidemic was beginning to assume alarming proportions. The peak period was reached in the week ending December 26th, in which 224 cases occurred in Naples.

The epidemic and the remarkable success that followed the measures of control have already been described by several authors [see, for example, this *Bulletin*, 1946, v. 43, 638-9] but the present report contains a great deal of additional information with regard to the methods employed.

A few of the many points of interest in the paper are as follows :—The powder "MYL," which contained pyrethrum, was developed by a group of workers of the U.S.A. Department of Agriculture in 1942 ; and early in 1943 the U.S.A. Typhus Commission found that two applications at a 14-day interval reduced louse infestation to a low level.

In 1943, in Algeria, SOPER and his co-workers developed the new technique by which the powder is applied to persons and their clothing without undressing. The most suitable types of hand-dusting gun were found to be the

Dobbins "Superbuilt" No. 133, and the Hudson "Admiral" No. 765. MYL powder, which alone was used during the early stage of the epidemic, seems to have been as effective as the 10 per cent. DDT powder, which was also used to a large extent when it became available. One pound of DDT powder was enough to dust 15–20 persons. The method of application is fully described with the help of eight clear illustrations. Disinfestation of contacts and neighbours—"spot dusting"—is believed to have played an important part in arresting the epidemic before the later adoption of "mass dusting" of the whole population could have become effective. More than three million dustings were carried out during and after the epidemic; in the week ending January 16th, 435,721 persons were dusted.

The paper must be read by all who are concerned with the control of louse-borne diseases. *John W. D. Megaw.*

JAME, L. & JUDE, A. La vaccination contre le typhus exanthématique au cours de l'épidémie d'Algérie de 1941–1943. [**Anti-Typhus Vaccination during the 1941–1943 Epidemic in Algeria.**] *Schweiz. med. Woch.* 1947, May 31, v. 77, Nos. 22/23, 589–91.

No new work of note is recorded.

RAYNAL, J. H. Le dépistage du typhus exanthématique dans la population murine de Chang-Haï. [**The Detection of Typhus among the Rat Population of Shanghai.**] *Bull. Soc. Path. Exot.* 1947, v. 40, Nos. 3/4, 98–110.

The author states that in Shanghai the murine nature of the typhus infection in man and its origin from infection among local rats are now "well established." In the present study, the sera of all the rats captured in the French Concession were subjected to Weil-Felix tests, and the occurrence of titres of 1–100 or over was regarded as evidence that the rats had been attacked during the preceding 10 to 20 days.

In a period of 56 months, from late November 1940, and the end of July 1945, 3,388 rats were examined, and of these 211 (6·2 per cent.) were positive at 1–100 or over. From 1941 till 1945 the yearly percentages of positive reactions were: 7·1; 10·3; 5·4; 4·4; and 2·5. The corresponding numbers of positive Weil-Felix reactions observed in human sera during these years at the local Pasteur Institute were: 131; 301; 99; 73; and 23.

It was impossible to find room for the detailed statistics in the paper, but the occurrence of ephemeral epizootic outbreaks among rats is shown by the following figures, which are percentages of positive reactions observed among the rats captured during 10-day periods at the times stated. In 1941, there were two high peaks, one of 40 in June and one of 23 in August. In 1942, there was a severe outbreak with a high peak of 60 in early April, another outbreak reaching 35 in September, and a third reaching 26 in November. The author states that afterwards there were practically no important outbreaks among rats, but he mentions the following peaks as occurring:—In 1943, one of 18 in April, and one of 22·5 in July; in 1944, one of 14 in early March and one of 23 in August; in 1945 there was a peak of 20 in early July.

BECK, M. Dorthy & VAN ALLEN, Alwine. **Typhus Fever in California, 1916–1945, Inclusive. An Epidemiologic and Field Laboratory Study.** *Amer. J. Hyg.* 1947, May, v. 45, No. 3, 335–54, 1 fig. [39 refs.]

In accordance with the usage customary among U.S.A. workers the authors employ the term "typhus fever" as including murine typhus, but not the tick-borne rickettsial fever or fevers which elsewhere are generally regarded as belonging to the typhus group.

A detailed analysis is given of all the cases of typhus fever reported in California. Apart from one epidemic of louse-borne typhus in which 32 cases occurred among Mexican labourers in 1916–17, the disease has conformed to the murine-typhus pattern in its seasonal and place distribution. Between 1921 and 1924 the yearly number of cases ranged from 6 to 18; from 1925 to 1935 not more than four cases were reported in any year; from 1936 onwards the incidence has increased—in 1944, there were 44 cases, and in 1945 there were 62.

Cases have been reported from only five counties out of the 16 in the State. In these five counties field surveys have revealed that *Rattus norvegicus*, *R. rattus*, *R. alexandrinus*, and *Mus musculus*, were natural reservoirs of infection. Ground squirrels, though not found infected in natural conditions, were shown by experiment to be potential reservoirs.

Among large numbers of rats captured at random in the 11 non-endemic counties, only one was found to harbour infection. *John W. D. Megaw.*

HILL, E. L. & INGRAHAM, S. C. **A Study of Murine Typhus Fever in Coffee County, Alabama.** *Pub. Health Rep.* Wash. 1947, June 13, v. 62, No. 24, 875–81.

The authors describe a study of murine typhus in the predominantly rural area of Coffee County, Alabama, which lies between 31° and 32° north latitude.

During 1943, the officially reported cases numbered 61, but in a house-to-house survey it was found that 211 persons stated that they had been attacked during the year. Sera of 177 persons belonging to the latter group were examined by complement-fixation and Weil-Felix tests, and 137 were regarded as positive on the strength of complement-fixation titres of 1–16 and over, or of Weil-Felix titres of 1–160 and over. In 100 of the cases both reactions were positive. Two deaths from the disease occurred during the year.

The incidence rate was 428 per 100,000; it was approximately the same in rural and urban localities, and infection was obviously associated with dusty occupations in rat-infested places.

Positive complement-fixation reactions were obtained in 42 per cent. of 431 rats caught on farms; the percentage of positives was 55 among the 228 rats found infested by *Xenopsylla cheopis* and 32·5 among the 203 that were not infested. *John W. D. Megaw.*

DIERCKS, F. H. & TIBBS, R. O. **A Rapid Method for the Staining of *Rickettsia orientalis*.** *J. Bacteriology.* 1947, Apr., v. 53, No. 4, 479–80.

Giemsa's and other stains have not proved entirely satisfactory for the staining of *Rickettsia orientalis* in yolk sac tissues, particularly because of the long staining time involved.

The authors therefore examined yolk-sac smears of the Karp strain of *R. orientalis* (in which 100 to 200 organisms per field were found when the smears were stained with Giemsa's stain) in a study of the efficacy of some 30 staining solutions. Each stained preparation was graded in terms of selectivity of the stain, differentiation, intensity of staining, stability of the solution and distinguishing characters of the stain.

After suitable "screening," it became evident that methylene blue and its derivatives or combinations were the most useful of stains; and satisfactory results were obtained with MacNeal's tetrachrome stain [*J. Amer. Med. Ass.*, 1922, v. 78, 1122].

For use, the tetrachrome stain, prepared according to the manufacturer's directions, is prepared as a stock: the optimum *p*H is 6·5 to 7·0. Air-dried

yolk-sac smears are fixed in absolute methyl alcohol for 3 to 5 minutes. The working solution is prepared by adding 4 to 5 cc. of the stock solution to 75 cc. of distilled water. The slides are transferred from the fixative to the stain in Coplin jars with gentle agitation and stained for 15 to 20 minutes. The preparations are cleared in absolute acetone, blotted dry and examined under oil-immersion, a blue ground-glass filter being used.

Staining is uniform and is retained for at least 12 months. The background is pinkish, the rickettsiae stain a characteristic dull blue, blood cells are differentially stained and any bacteria present show an intense blue colour and are relatively large.

The advantages of the tetrachrome method are (1) ready availability and stability, (2) fixing reduces the chance of accidental infection from the slides, (3) the staining time is short, and allows for three times as many slides to be ealt with daily as could be handled when Giemsa's stain is used, (4) simplicity and reliability make the method useful for workers inexperienced in staining rickettsiae.

The disadvantages are that the stain is not so intense as Giemsa and is not satisfactory for morphological or photographic studies; also, consistent results are not obtained in staining rickettsiae in animal's tissues, *e.g.* spleen and liver smear. *H. J. O'D. Burke-Gaffney.*

TULLIS, J. L., GERSH, I., JENNEY, Elizabeth, MCLIMANS, W. F. & VINSON, J. W. **Tissue Pathology of Experimental Tsutsugamushi Disease (Scrub Typhus) in Swiss Mice and *Macacus rhesus* Monkeys and the Report of One Human Case acquired in the Laboratory.** *Amer. J. Trop. Med.* 1947, May, v. 27, No. 3, 245–57, 1 text fig. & 50 figs. on 6 pls. [11 refs.]

The authors describe the histological changes found in the following infections with the Karp strain of *Rickettsia orientalis*: (1) 45 mice, each of which was inoculated intraperitoneally with 1,000 m.l.d. of yolk-sac suspension; (2) 10 monkeys, inoculated intradermally, intravenously and intraperitoneally, with yolk-sac suspension, and (3) a man who died on the 17th day of an illness resulting from laboratory infection, presumably acquired through inhalation of infected yolk-sac material with which he had been working.

Many of the mice were killed and examined at various intervals after inoculation, the rest died 9–12 days after inoculation. None of the monkeys died of the infection, which caused an illness lasting about 15 days.

The paper is illustrated by 50 excellent photomicrographs reproduced at a magnification of 60 diameters.

The changes observed were similar to those recorded by other workers; they consisted of lymphocyte-macrophage-plasma cell proliferation followed by invasion of mesenchymal tissues by these cells, which were carried by the blood stream.

Among mice, the spleen was the first organ to show signs of reaction; lymphocytes from this and from the lymph nodes gave rise to perivascular infiltrations and collections of lymphocytes in the various organs.

The authors emphasize the absence of destructive changes in the vascular endothelium, which showed only swelling, hypertrophy and "stickiness", but rarely to a degree causing tissue necrosis such as occurs in Rocky Mountain spotted fever and epidemic typhus, in which "destruction of the vascular endothelium, thrombus formation, infarction, and necrosis, are evident."

[The authors are hardly justified in suggesting that severe endothelial damage is a universal feature of Rocky Mountain spotted fever and epidemic typhus, and that it is universally absent in scrub typhus. Among the different strains of rickettsiae occurring in each of these three diseases there is a wide

range of variation in virulence and correspondingly in the intensity of the tissue changes observed in various outbreaks. Other workers are by no means unanimous in regarding the histological changes occurring in scrub typhus as being essentially different from those seen in epidemic typhus and Rocky Mountain spotted fever. In this connexion the article by SETTLE *et al.* (see this *Bulletin*, 1946, v. 43, 27) deserves attention.] *John W. D. Megaw.*

TEMPLETON, W. C. **Scrub Typhus in Malaya.** *J. Roy. Army Med. Corps.* 1947, Apr., v. 88, No. 4, 153–61, 1 chart.

During the period October 1945 to February 1946, the author studied 56 cases of scrub typhus, all but one of which occurred among troops stationed in or near Kuala Lumpur where FLETCHER, LEWTHWAITE, and others had investigated the disease.

The symptomatology as described in the paper conformed to the recognized pattern: there were three deaths.

The Kahn test was carried out on some patients; the reaction was never more than doubtfully positive, and was always negative after defervescence.

Four cases of "urban typhus" occurred during the period. Clinically these could not be distinguished from cases of scrub typhus without eschar, except by their relative mildness and by the Weil-Felix test. In all four, the *OXK* titre showed a rise—to 1–320; 1–320; 1–160; and 1–40, respectively; the corresponding *OX19* titres were 1–1,280 in the first three, and 1–640 in the fourth case.

In 10 severe or complicated cases of scrub typhus penicillin was given, usually in doses of 40,000 units every three hours up to a total of 1,600,000 units. Little or no improvement was observed but "the anticipated deterioration of condition did not occur." The duration of the fever was not affected. One of the patients, who was treated from the 8th day with doses of 20,000 units, up to a total of 900,000 units, died on the 17th day after repeated bouts of haematemesis; the gastric mucosa after death was found to have numerous haemorrhagic points. *John W. D. Megaw.*

BAKER, J. A. **A Rickettsial Infection in Canadian Voles.** *J. Exper. Med.* 1946, July 1, v. 84, No. 1, 37–50, 2 figs. on 1 pl.

The author reports the very interesting discovery that many of the voles (*Microtus pennsylvanicus pennsylvanicus*) in Grosse Isle are infected by a rickettsia which seems to be related to the Karp strain of *Rickettsia orientalis*, and which is probably transmitted from vole to vole by the mite *Trombicula microti*.

Grosse Isle is in the St. Lawrence River, 29 miles down-stream from Quebec City, and is four miles distant from the nearest shore.

Yolk-sac cultures of suspensions of enlarged or normal spleens of some of the voles were found to contain rickettsiae after one or more serial passages. Most of the infected embryos died five to seven days after inoculation.

With yolk-sac material obtained after 10 to 15 serial passages, mice, hamsters, rats, and guineapigs, were successfully inoculated by the intraperitoneal route. Successful inoculation was indicated by the occurrence of rickettsiae in yolk-sac cultures of suspensions of the spleen or blood of the animals. Two monkeys were inoculated by the same route, but rickettsiae could not be recovered from their spleens.

Direct transmission of infection from animal to animal by infected blood was successful only with hamsters.

With the assistance of Dr. Norman Topping a study was made of the relationship between the organisms and known strains of rickettsiae.

Morphologically, the closest relationship was with the Karp strain of *Rickettsia orientalis*. Guineapigs inoculated with the vole strain showed no immunity against Rocky Mountain spotted fever, epidemic typhus, murine typhus, or the Seerangayee strain of scrub typhus; but mice inoculated with suitable doses of the vole strain were found immune to lethal doses of the Karp strain of scrub typhus.

Sera of two monkeys inoculated with the Karp strain gave positive complement-fixation reactions with antigens of the Karp and vole strains at titres of 1–256 and 1–512. However, two other monkeys inoculated with the vole strain reacted, at titres of 1–64 and 1–256 against normal-yolk-sac antigen, and at titres of 1–16 and 1–256 against both the Karp and the vole strain of antigen. [This is a striking example of a non-specific fixation reaction.]

Sera of guineapigs inoculated with the Karp and vole strains gave positive reactions at titres of 1–8 to 1–64 against the homologous antigens, but negative reactions against the heterologous antigens.

Voles were numerous on the island; they harboured seven species of fleas, one of a non-blood-sucking louse, three of mites, of which only one—*Trombicula microti*—was blood sucking; and one of a tick (*Ixodes sp.*).

From a hamster inoculated with a suspension made from a pool of 20 mites (*T. microti*) taken from two voles, rickettsiae similar in appearance to the vole strain were recovered by yolk-sac culture.

An attempt to transmit infection from an infected to a clean hamster by fleas (*Nosopsyllus* [=*Ceratophyllus*] *fasciatus*) was unsuccessful.

The conclusions reached are that voles on the island have "an inapparent infection due to a rickettsia that may be related to the rickettsia of scrub typhus" and that mites "have a probable part in the epidemiology."

The author speculates on the possibility that the strain may have resulted from the modification of *R. prowazeki* through prolonged sojourn in a mite-vole environment, or that scrub typhus itself may have been introduced into the island. Apart from these possibilities, he concludes that a new species must be added to the rickettsia family.

[The last suggestion seems to be the most likely; if it is confirmed the organism would suitably be called *Rickettsia bakeri*.] *John W. D. Megaw.*

HUEBNER, R. J., JELLISON, W. L. & ARMSTRONG, C. **Rickettsialpox—a Newly Recognized Rickettsial Disease. V. Recovery of *Rickettsia akari* from a House Mouse** (*Mus musculus*). *Pub. Health Rep.* Wash. 1947, May 30, v. 62, No. 22, 777–80.

The authors have recovered *Rickettsia akari* from naturally infected house mice (*Mus musculus*) trapped at the site of an outbreak of rickettsialpox [see this *Bulletin*, 1947, v. 44, 411].

Previous attempts to isolate the rickettsia of rickettsialpox from mice were frustrated by the occurrence of choriomeningitis infection among the mice, so that guineapigs and Swiss mice used in inoculation experiments died of this infection.

This complication was overcome by immunizing Swiss mice against the virus of choriomeningitis and later inoculating them with suspensions of liver and spleen of three house mice trapped in the infected houses.

Rickettsiae identical with those recovered from human patients and mites were isolated. Details are given of the cross-immunity and complement-fixation tests by which the identity of the mouse strains was established.

Mice from the infected homes were shown by direct challenge and by complement-fixation tests to be immune against the disease.

The findings show that the house mouse is a natural reservoir of infection and suggest methods for the investigation of suspected foci of the disease.

*John W. D. Megaw.*

PREOBRASHENSKI, A. A. [**Tick-borne Fever in the Maritime Province.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 4, 53–62, 6 figs. [In Russian.]

The author gives a detailed account of a form of tick-borne typhus fever occurring in the Soviet Far East, based on recent epidemiological observations. The disease, which is transmitted by *Dermacentor sylvarum* and *Haemaphysalis concinna*, has a seasonal distribution, its incidence gradually rising from April to a maximum in May and falling to a minimum in June, while in July and August only isolated sporadic cases are encountered. The foci of the disease are characterized by the presence of bush vegetation, representing the favourite haunts of the ticks, especially the first-named species. These ticks first appear towards the end of March, reaching considerable numbers in April and May and declining in June, after which only single specimens are encountered. The seasonal fluctuation in the numbers and activity of *D. sylvarum* thus corresponds to the seasonal variation in the incidence of the disease. The parts of the human body most subject to the bites of this tick are the hairy parts of the head, neck, shoulders, genitals and shins. The meteorological factors affecting the activity of the vector have an indirect effect upon the dynamics of the incidence of the disease. Thus, a fall in the temperature of the air and an increase in the number of rainy days are followed by a decline in the incidence, and, *vice versa*, a rise in the temperature and reduction of rainfall bring about an increase in the incidence. The Weil-Felix reaction in this type of fever is especially sensitive with *Proteus OX19*, which gives a positive reaction in 100 per cent. of cases during the third week in dilutions not lower than 1 : 160. It is recommended as a supplementary diagnostic method from the second week of the disease.

*C. A. Hoare.*

BLANC, G., MARTIN, L. A. & MAURICE, A. Le Mérion (*Mériones shawi*) de la région de Goulimine est un réservoir de virus de la Q. fever marocaine. [**The Gerbille *Meriones shawi* as a Reservoir of Q Fever Infection in the Goulimine Region of Morocco.**] *C. R. Acad. Sci.* 1947, June 9, v. 224, No. 23, 1673–4.

In Morocco, natural infection of *Hyalomma savignyi* with *Rickettsia burneti* has been found : the authors have isolated four strains from these ticks in the Goulimine area ; while most of these ticks were found on goats and sheep, one batch came from the neighbourhood of burrows inhabited by the gerbille, *Meriones shawi*.

The authors were able to infect a goat easily and the animal developed a severe febrile illness, during which the rickettsiae could be recovered from the blood. Further work on the possible rôle of the goat as a reservoir of *R. burneti* is in progress.

The fact that *Hyalomma* were found near the burrows of *M. shawi* seemed to be significant, but the authors failed to obtain evidence of infection in nymphs of this species or of *Rhipicephalus* caught on the gerbilles. Nevertheless, two of three lots of spleens from these animals were found to be naturally infected, and this infection was established experimentally in a guineapig.

Cross immunity could be demonstrated between the two strains isolated from the gerbille and strains from *Hyalomma*.

The authors consider that, in the Goulimine region, *Meriones shawi* is an important reservoir of Q fever infection. *H. J. O'D. Burke-Gaffney.*

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## DENGUE AND ALLIED FEVERS.

BLACK, W. C., FLORIO, L. & STEWART, Mabel O. **A Histologic Study of the Reaction in the Hamster Spleen produced by the Virus of Colorado Tick Fever.** *Amer. J. Path.* 1947, Mar., v. 23, No. 2, 217–25, 2 figs. on 1 pl. & 1 text fig.

The authors describe a characteristic, but not necessarily pathognomonic, reaction which occurs in the spleen of hamsters inoculated intraperitoneally with the virus of Colorado Tick Fever.

The reaction reached its height on the third day after inoculation, and was observed in 79·3 per cent. of 520 infected hamsters ; it consisted of (*a*) a reduction in the number of lymphoid cells in the centre of the follicles, (*b*) the appearance of large mononuclear cells, polymorphonuclear leucocytes, and erythrocytes, throughout the follicles, and (*c*) a partial or complete disappearance of the well-defined margins of the follicles.

The paper is illustrated by two photomicrographs, one of an affected, and one of a normal, spleen. *John W. D. Megaw.*

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## PLAGUE.

WAYSON, N. E. **Plague-Field Surveys in Western United States during Ten Years (1936–1945).** *Pub. Health Rep.* Wash. 1947, May 30, v. 62, No. 22, 780–91.

During these 10 years of survey, more than 595,097 rodents and 1,186,777 fleas have been examined with 461 positive results. The surveys have been made in each of 487 counties out of a total of 644 counties between the Pacific Coast and the 100th meridian, and the Canadian and Mexican boundaries in 17 Western States. In California, collections of infected animals and parasites were obtained from 33 out of 58 counties between 1908 and 1945.

Many important generalizations and also much detail are enshrined in this record.

Under experimental conditions, the development of the condition within the flea which effects or aids in transmission varies within wide limits of time, from 5 to 10 days in *Xenopsylla cheopis* to 15 days in *Nosopsyllus fasciatus* and even 3 months in other species. A degree of flea-host selectivity has been noted, such as might be a retarding factor in dissemination from an animal of one genus to that of another. But this much is established, that if fleas are hungry they will feed on hosts of several genera. Fleas are different in genera and species but " all of the laboratory studies confirm previous findings that *Pasteurella pestis* . . . exhibits consistent characteristics which do not permit of differentiation of strains recovered from rats, from other rodents, from fleas or from man." One infectious flea, it seems, is capable of transmitting the disease " to each of several animals on which it feeds, though it may not infect all of them." A question which has constantly recurred to the epidemiologist is that of the carry-over of plague from the off-season to that of its

recrudescence. Much work has been done in American laboratories with hibernating animals as the test. No evidence is forthcoming, apparently, to substantiate the view " that a rodent carrier of subacute or chronic plague is a factor in the perpetuation of the enzootic." Nevertheless, fleas cannot be infected except on animals presenting a marked degree of bacteraemia, and it would seem to follow that acute recrudescence in the carrier of the quiescent disease was a necessary antecedent to carry-over of the disease. This is difficult to prove or to examine. A general conclusion is that many factors still require examination to explain the spread of sylvatic plague and that " an element of chance enters into the fulfilment of conditions favourable to the progressive spread of the disease." *W. F. Harvey.*

GIRARD, G. & SANDOR, G. La nature de la toxine pesteuse. [**Nature of Plague Toxin.**] *C. R. Acad. Sci.* 1947, Apr. 9, v. 224, No. 14, 1078–80.

Endotoxins were generally in the past characterized as nucleoproteins. Chemical analysis of microbic antigens has progressed considerably, and the authors refer especially to the work of BOIVIN, who described a glucolipidic complex in the endotoxins of many Gram-negative pathogenic organisms, which was absent from the true exotoxins. They have not, however, been able to demonstrate this complex in either virulent or avirulent plague bacilli. In their present work, they have compared serum of horses hyperimmunized by intravenous injection of formol toxin (anatoxin) with that of horses similarly injected with avirulent but toxic bacilli. Fractionation of the sera furnished euglobulins I and II, representing bacterial precipitating and protective antibodies; and pseudoglobulin, representing true antitoxin. The distribution of the antibodies among the three fractions was absolutely identical in the two types of sera, mostly in euglobulin I and to a very slight extent in the pseudoglobulin. Their conclusion is that: (1) a principle of protein nature is attached to the bacillary bodies; (2) it diffuses into liquid culture media; (3) it accounts for most of the pathogenic and immunizing characters of the plague bacillus; (4) it may be injected as bacilli or dissolved; and (5) thus there is demonstrated the complete divergence between true exotoxins and the so-called " endotoxins."

*W. F. Harvey.*

RAMON, G., GIRARD, G. & RICHOU, R. De l'influence sur la toxine pesteuse des filtrats de culture de *B. subtilis*, de *Penicillium notatum*, *d'Actinomyces griseus*. [**Influence on Plague Toxin of Filtrates from Cultures of** *B. subtilis*, *Penicillium notatum* **and** *Actinomyces griseus*.] *C. R. Acad. Sci.* 1947, May 5, v. 224, No. 18, 1259–61.

The authors have previously shown [*Bulletin of Hygiene*, 1946, v. 21, 693] that filtrates of *B. subtilis* cultures may alter and finally destroy the exotoxins of certain bacteria: and they subsequently demonstrated a like capacity in filtrates of *Penicillium notatum* and *Actinomyces griseus*.

They have now studied the effect of such filtrates on plague toxin, in view of its immunological differences from the true exotoxins.

In toxicity experiments on mice, which are described, it is shown that a single filtrate of *B. subtilis* which had a "*titre antidotique*" of 450 units per cc. alone had any appreciable effect on plague toxin: one of three mice survived and the other two died after an interval. The action was therefore weak, since the same filtrate was able to destroy large doses of staphylococcus and diphtheria toxin in 24 hours.

The authors conclude that plague toxin also differs from the true exotoxins in its behaviour towards filtrates of " microbial antagonists ".

*H. J. O'D. Burke-Gaffney.*

## AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS.

DE BRUYN, P. P. H. **Theories of Amoeboid Movement.** *Quart. Rev. Biol.* 1947, Mar., v. 22, No. 1, 1–24, 10 figs. [Numerous refs.]

HILL, K. R. **Laboratory Diagnosis of Intestinal Amoebiasis.** *Lancet.* 1947, June 28, 903–6.

The purpose of this paper is to supplement the often brief accounts of the laboratory diagnosis of intestinal amoebiasis contained in textbooks. It is based on the author's experience in West Africa Command and on notes compiled by the former assistant directors of pathology there, Lieut.-Colonels B. G. MAEGRAITH and G. T. L. ARCHER. The resulting paper contains a wealth of practical detail which will be invaluable to the pathologist in Britain and the newly-arrived medical officer in the Tropics; and, indeed, their more experienced tropical colleagues will equally profit from it.

The paper is entirely practical and should be studied closely in the original: but a number of features merit special note. In discussing acute intestinal amoebiasis, the author stresses the importance of careful collection and naked-eye inspection of material and of skilful selecting of the most suitable specimens. He rightly notes the great value of preliminary examination of specimens with a low-power objective; he disposes of the belief that there is a typical amoebic exudate; "an exudate is said to be 'amoebic' only when *Entamoeba histolytica* is found." The differentiation of amoebae in saline preparations is carefully treated and the author makes the timely reminder that vegetative forms of *E. histolytica* should never be diagnosed unless the amoebae are progressively motile and contain ingested red cells. The non-pathogenic species most likely to cause difficulty is *Dientamoeba fragilis*, which, like *E. histolytica*, produces finger-like pseudopodia explosively; but these may be multiple, producing a stellate appearance, the ends sometimes become spherical and the resting amoeba becomes perfectly circular, all features which are absent in the case of *E. histolytica*. The morphology of the common species is described and the difficulty in recognizing the nucleus of *E. histolytica* in fresh preparations is pointed out. "Rounded-off" degenerate forms may be revived by means of a warm stage: otherwise they should not be reported, even provisionally, as *E. histolytica*. Aqueous smears are useful in differentiating *E. histolytica* from *D. fragilis*, since the mode of destruction of the latter (destruction occurs with all vegetative amoebae in 5–15 minutes) consists of explosive extrusion of the endoplasm, with an immediate sealing of the point of extrusion and the formation of a perfect transparent sphere; this does not occur with *E. histolytica* or other related forms; in the case of the former and *E. coli*, the endoplasm is never completely emptied after rupture. *E. nana* and *I. bütschlii* burst after distension.

Vital staining has been found successful and has shown motile amoebae as long as 7 hours after preparation at West African laboratory temperatures. The stain consists of two solutions:—

*Solution A.*

| | |
|---|---|
| Brilliant cresyl blue ... ... | 0·2 gm. |
| Sod. citrate ... ... ... | 1·1 gm. |
| Sod. chloride ... ... ... | 0·55 gm. |
| Hydrarg. perchlor. (sat. soln.) ... | 0·1 cc. |
| Water ... ... ... ... | 100 cc. |

*Solution B.*

| | |
|---|---|
| Eosin ... ... ... ... | 1 gm. |
| Water ... ... ... ... | 100 cc. |

For use, a selected piece of mucus is emulsified on a slide in a mixture of equal loopfuls of solutions A and B, and a coverslip applied. Active amoebae are easily picked out under the low-power objective, as blue-green objects.

In connexion with the examination of material from chronic intestinal amoebiasis, the author describes the use of saline and iodine preparations: multiple examinations of a specimen are more useful than concentration methods for cysts.

The author advocates the examination of specimens every second or third day for ten days in suspected cases: in convalescence, stools should be examined daily for a week before discharge, then once a month for 3 months, and thereafter every 6 months if necessary.

The differentiation of *E. histolytica* cysts from other varieties is discussed at length, as is their differentiation from other objects, such as *Blastocystis hominis*; aqueous preparations facilitate the recognition of the latter, which rapidly loses its refractibility.

The author boldly attacks the difficult problem of identifying cysts having four nuclei or less, and describes at some length the nuclear and other features on which such identification may be based.

Finally, mention is made of such adjuncts to diagnosis as provocative emetine and sigmoidoscopy, and a routine method of the latter is described, which includes the prior administration of saline enemata, followed by microscopic examination of the result before the actual sigmoidoscopy is performed.

[This extremely useful paper should be kept at hand by every laboratory worker who requires to be informed, or refreshed, upon the practical details of diagnosing intestinal amoebiasis.] *H. J. O'D. Burke-Gaffney.*

SANTIAGO-STEVENSON, D., MARTINEZ, E. C. & HERNANDEZ-MORALES, F. **Hepatic Complications of Amebiasis in Puerto Rico.** *Bol. Asoc. Med. de Puerto Rico.* 1947, Apr., v. 39, No. 4, 123–33, 5 figs. [19 refs.]

Infestation of the intestine with *E. histolytica* in Porto Rico is probably within the range quoted by CRAIG (*Amebiasis and Amebic Dysentery*, 1934), who found an average of 11·6 per cent. in surveys of continental U.S.A.

Clinical manifestations are, however, not so common: the authors quote 46 cases in which *E. histolytica* were found in the stool, although only in seven patients could symptoms be attributed to the presence of the parasite, and only two were classed as amoebic dysentery. Furthermore, only 0·45 per cent. of 14,497 admissions to the medical wards of the Rodríguez General Hospital between 1942–1945 were diagnosed as clinical amoebiasis.

Whilst local medical opinion has considered that amoebic liver involvement is rare, the authors suggest that it may be more frequent than has been suspected hitherto. They discuss the pathology, clinical features and diagnosis of amoebic hepatic lesions, and distinguish the early frank hepatitis from the suppurative stage. They stress the value of X-rays in diagnosis and of emetine in treatment.

They then give full case histories of five patients, three with hepatitis and two with abscess, seen in general hospitals in 3 years. Early diagnosis of amoebic hepatic involvement is stressed, in view of the therapeutic implications "The most important factor in the diagnosis of amebic hepatitis is the awareness of the occurrence of this complication." *H. J. O'D. Burke-Gaffney.*

AMALFITANO, G. Pseudocancro del ceco di origine amebica. [**Pseudocarcinoma of the Caecum of Amoebic Origin.**] *Riv. di Biol. Colon.* Rome. 1946, v. 7, 79–96, 6 figs. [15 refs.]

The author lists nearly a score of conditions which may give rise to swelling in the right iliac fossa, some extra-intestinal as affections of the pelvis, ovary,

etc. ; others intra-intestinal as an aggregation of worms ; others, again, of the wall of the bowel, such as carcinoma, tuberculosis, syphilis, actinomycosis, chronic colitis, " fibroplastic appendicitis " and amoebiasis, among others. He then describes the case of a man of 49 years, a bricklayer, who during his military service in 1917 had an attack of dysenteric symptoms which was diagnosed as duodenal ulcer and cleared up after a year's treatment with kaolin and belladonna. In 1942, he had another dysenteric attack which lasted for 45 days. In December that year he had vague pains with fever and, on a diagnosis of hepatitis, probably of amoebic origin, was given emetine. The fever disappeared, but abdominal pain persisted and a swelling developed in the right iliac fossa. *Minuta* forms of *E. histolytica* were seen in the faeces. A negative W.R. ruled out syphilis ; X-rays after a bismuth meal showed that the swelling was in the wall of the caecum and after considering cancer, tuberculosis and intestinal parasites it was decided to give a course of emetine, and the tumour disappeared. [The title of this paper is not well chosen ; because amoebiasis of the caecum may be confused with malignant growth, this is not an adequate reason for a diagnosis of " pseudocarcinoma." See also this *Bulletin*, 1943, v. 40, 145 ; 1946, v. 43, 133, 651, 1140.] *H. Harold Scott.*

COLLARD, P. & KENDALL, D. **Cerebral Amoebiasis treated with Emetine. Report of a Case.** *Lancet.* 1947, July 5, 17–18, 1 chart.

A regular soldier served eight years in the Middle East, where he suffered from numerous diarrhoeal attacks ; no diagnosis of dysentery was made at the time of these. Two weeks after his return to Britain he became acutely ill. On admission to a neurosurgical unit he had fever (101·4°F.), weakness of the right external rectus, moderate neck rigidity, and a bilateral positive Kernig's sign, but no abdominal signs. The cerebrospinal fluid was clear, at a pressure of 110 mm., and contained 180 mgm. of protein and 10 lymphocytes per cmm. The white cell count was 14,200 per cmm. ; no cystic or vegetative *Entamoeba histolytica* were found in five stool specimens. A week later, the liver was found to be enlarged and tender. A course of emetine hydrochloride, one grain daily, was begun ; in 48 hours improvement was apparent ; within six days the general condition had much improved, the fever being slight and intermittent and the symptoms and signs in the liver area diminished ; the weakness of the right external rectus had gone, but some weakness of the right lower face had developed. In another week, when the cerebrospinal fluid was re-examined, it was found to be normal. Convalescence was interrupted by an acute right-sided lobar pneumonia ; on radiological screening, two months after treatment with emetine, the diaphragm was found to be raised and limited in movement. A course of E.B.I. was subsequently given, and the patient was eventually discharged apparently fully recovered in every respect but for persistence of the raised level and deformity of the right diaphragm.

[In the reviewer's opinion, this might well have been an example of early cerebral amoebiasis following hepatic amoebiasis. It is unfortunate that the diagnosis rests solely on such evidence as the history, on liver involvement, and on the " dramatic response to emetine," and that it was not founded on the securer grounds of a microscopical diagnosis of the basic infection.]

*A. R. D. Adams.*

KOURÍ, P., IRIONDO, M. & FUSTÉ, R. Amebiasis cutanea por *Endamoeba histolytica.* Reporte de un caso personal. [**Cutaneous Amoebiasis caused by** *E. histolytica.*] *Kuba.* Habana. 1947, Apr., v. 3, No. 4, 98–9.

ARNETT, J. H. **Treatment of Carriers of *Endamoeba histolytica* and other Protozoa with Carbarsone, Chiniofon and Vioform.** *Amer. J. Med. Sci.* 1947, May, v. 213, No. 5, 608–10.

In previous studies, the author and his colleagues reported an incidence of carriers of *E. histolytica* in certain institutions in Philadelphia amounting to 4 to 11 per cent. [this *Bulletin*, 1936, v. 33, 529 ; *ibid.*, 1942, v. 39, 554] : these figures were a local confirmation of the opinion of CRAIG (*Amebiasis and Amebic Dysentery*, Baltimore, 1934, p. 46), and others, that 5 to 10 per cent. of people in the United States harboured this parasite.

In the present study, the author examined the efficacy of certain drugs in relieving carriers of their amoebae : it is emphasized that the work was not concerned with the problem of treating persons actually suffering from amoebic dysentery. In the early part of the work, two courses of chiniofon or carbarsone were given to alternate patients : later, this was reduced to one course, and finally vioform was given to 12 successive patients. The study was controlled by stool examinations before, during and for some time after treatment.

The following criteria were adopted :—

(1) " For inclusion in this study " : at least two positive stools before treatment.

(2) For " disappearance " : at least two negative stools during treatment or for a week after.

(3) For " reappearance " : recurrence of one or more positive stools after " disappearance."

The results with the different preparations were as follows :—

*Chiniofon.*—This was given as 1 pill of 0·25 gm. three times daily on the first day, 2 pills on the second to the fifth days, and 3 pills on the sixth and seventh days. Of 16 carriers of *E. histolytica*, 4 were not given full treatment because of diarrhoea. In 11 of the remaining, *E. histolytica* disappeared from the stools in an average of 2·9 days. The twelfth patient required a second course before the organism finally disappeared.

*Carbarsone.*—This took the form of 1 capsule of 0·25 gm. morning and evening for 10 days. Of 13 carriers, 4 complained of diarrhoea, diarrhoea and dizziness, constipation and rectal itching respectively. In one case, it was necessary to discontinue the drug temporarily. In 12 cases, the parasite disappeared in an average of 1·9 days : in the thirteenth, it only disappeared 6 weeks after a second course of carbarsone.

*Vioform.*—This was given as 1 capsule of 0·25 gm. 3 times daily for a week. In all of 12 cases, *E. histolytica* disappeared from the stools in an average of 1·7 days.

All three drugs were thus efficient in ridding apparently healthy carriers of *E. histolytica* : less success was encountered, however, in the case of other protozoa, which were studied as a secondary investigation. Details are given of the effects of the 3 drugs in the case of carriers of *E. coli*, *Endolimax nana*, *Dientamoeba fragilis*, *Iodamoeba*, *Giardia* and *Chilomastix*. In the few cases studied, the parasites tended to reappear when treatment was stopped, and in general the drugs were not as effective as they were in eliminating *E. histolytica*.

*H. J. O'D. Burke-Gaffney.*

OSTROUMOV, V. G. [**Materials on the Problem of the Identity of *Balantidium suis* and *B. coli*.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 5, 43–4. [In Russian.]

Previous surveys carried out in Soviet Central Asia have shown that the incidence of *Balantidium coli* infection in man was extremely low, while in pigs

it reached 62 per cent. in some localities. The author undertook an investigation with the view to throwing further light on the incidence of balantidial infection in pigs and the rôle of these animals as reservoirs of human infection. The examination of the intestinal contents of numerous pigs revealed the presence of ciliates almost exclusively in the caecum while the distal portion of the large bowel was very rarely infected. Neither the active forms nor their cysts were ever found in the stools. A comparison of the structure of the porcine and human balantidia has convinced the author that they represent two distinct species: *B. coli* in man and *B. suis* in the pig. The two strains also differed in their cultural requirements. Though the incidence of infection in pigs was high, the author failed to discover any cases of infection among the workers in the slaughter-house from which the material was obtained. From these observations, he concludes that domestic pigs play no part in the epidemiology of human balantidiosis. *C. A. Hoare.*

MAY, Ella L. *Isospora hominis* **in Man. Report of a Case.** *Amer. J. Trop. Med.* 1947, May, v. 27, No. 3, 323–6, 5 figs.

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## RELAPSING FEVER AND OTHER SPIROCHAETOSES.

BALTAZARD, M., MOFIDI, C. & BAHMANYAR, M. Solution aux difficultés de l'expérimentation avec le spirochète d'Obermeier, *S. recurrentis*, agent de la fièvre récurrente à poux. [**A Solution of the Difficulties of Experimenting with Obermeier's Spirochaete,** *S. recurrentis*, **the Agent of Louse-borne Relapsing Fever.**] *C. R. Acad. Sci.* 1947, June 30, v. 224, No. 26, 1858–60.

The study of *S. recurrentis* has been made difficult by the feeble receptivity of most laboratory animals, with the exception of monkeys. The authors have investigated the receptivity of newly-born rodents and find that all those born at an early stage of development can be infected, but that, among those tested, rabbits show the highest susceptibility.

Nineteen newly-born rabbits inoculated subcutaneously with blood from a human case of relapsing fever, all became positive after an incubation period of 18–36 hours, and by the 4th day showed an average of more than 200 spirochaetes per field. Of these 19 rabbits, 3 were sacrificed for passage, 4 died of the infection with enormously enlarged spleens, 3 had a single attack and recovered, and of the remainder, 8 had a second attack, of which 2 died. The relapse developed from 3 to 8 days after the first attack and lasted up to 4 days. The length of the infection in these animals makes it easy to obtain passages, and 33 rabbits have been infected with 7 different strains.

The most striking results have been obtained with emulsions of infected lice. Infection of newly-born rabbits was produced with each of 5 lots comprising respectively 30, 20, 28, 12 and 5 lice taken off relapsing fever patients, and subsequently fed for 10 days on a normal subject. No spirochaetes could be detected on dark-ground examination of emulsions of these lice, yet the five lots all produced infection, the first four being rapidly fatal.

Human lice will readily bite newly-born rabbits, and a single meal from an animal containing spirochaetes in its blood is sufficient to infect the lice, even though subsequently fed on normal human blood. Ten experiments with one lot of 11 lice, three of 5, one of 4 and five of single lice, each of which had a single infective meal were, 7 to 8 days later inoculated into young rabbits: seven gave positive results. *E. Hindle.*

BALTAZARD, M., MOFIDI, C., BAHMANYAR, M. & SEYDIAN, B. Modifications dans le comportement de souches de *Spirochaeta recurrentis* passées par les rongeurs. [**Modifications in the Behaviour of Strains of** *Spirochaeta recurrentis* **passaged through Rodents.**] *C. R. Acad. Sci.* 1947, July 7, v. 225, No. 1, 82–4.

An extension of the authors' previous observations on the great susceptibility of newly-born rodents to *Spirochaeta recurrentis* [see above]. When the strains were passaged rapidly on the 4th to the 6th day of infection, they preserved the same characters as when isolated, namely an infection of 3 days or more in white mice, a shorter and less intense infection in rats, and a very feeble or inapparent infection in guineapigs and adult rabbits. When, however, the infection in the newly-born rabbits was allowed to relapse and passages were made from them on the 1st, 2nd and 4th days of the relapse, a new type of infection was produced. This was invariably fatal in newly-born rabbits which showed an enormous spleen, discoloured liver and jaundice; in adult mice and rats it produced an intense infection of 15 days' duration; but in adult guineapigs no obvious infection.

One of the authors became accidentally infected with this strain, and after 5 days' incubation period had a slight febrile attack (39°C.) of only 24 hours' duration without spirochaetes appearing in the blood, and a second attack 11 days later, also without any spirochaetes being detected by microscopic examination, but during which the strain was isolated from the blood and found to be extremely pathogenic to rats and newly-born rabbits. Finally, a number of *Ornithodorus* were infected by feeding on a rat during the second passage of the strain, and transmitted the infection by bite.

Two other strains of *S. recurrentis* have been isolated and showed the same alteration, namely an increase of virulence to rodents, and diminution of virulence to man. This recalls observations on the Persian strain, *S. microti* [see this *Bulletin*, 1947, v. 44, 92]. Also, it seems probable that the same phenomenon occurred at the Georg Speyer Haus at Frankfurt, where their Russian strain of relapsing fever became very pathogenic to mice, but practically non-pathogenic to man, and was transmissible by *Ornithodorus*.

According to one of the authors the strain of *S. recurrentis* in man can be distinguished under dark ground illumination from *S. microti*, as the latter shows a double contour instead of a uniform refraction. It is considered that *S. recurrentis* is merely a variant of the stable species occurring in rodents and transmitted by *Ornithodorus*. *E. Hindle.*

SOFIEV, M. S. & LEITMAN, M. Z. [**On the Possibility of Transmission of Spirochaetes of Louse-borne Relapsing Fever by Ticks and of Spirochaetes of Tick-borne Relapsing Fever by Lice.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 5, 81–4. [In Russian.]

Tick-borne relapsing fever is endemic in Soviet Central Asia where its distribution is focal, corresponding to the areas where *Ornithodorus* occurs. On the other hand, louse-borne relapsing fever has been known to occur in that country sporadically in the course of several years, to disappear again for scores of years. Since the relationship of the two types of the disease has not been elucidated, the authors have undertaken a series of experiments with the following objects: (1) to study the behaviour of spirochaetes of louse-borne fever in *Ornithodorus*; (2) to determine whether these spirochaetes can be transmitted by the bite of ticks; and (3) *vice versa*, whether lice are capable of transmitting tick-borne spirochaetes. In the course of these experiments, ticks (*O. papillipes* and *O. tartakovskyi*) were fed on patients suffering from louse-borne relapsing fever. At different intervals, the ticks were dissected,

and their gut contents were examined microscopically and inoculated into guineapigs and mice. They were also allowed to feed on human volunteers and mice to determine the possibility of transmission by the bite. As regards the experiments with lice, laboratory-bred *Pediculus humanus corporis* were fed for five days on paretics infected with tick-borne fever for therapeutic purposes, and subsequently for five days on normal persons. On the sixth day after the last infective feed, the lice were emulsified and inoculated subcutaneously into other G.P.I. patients.

The results of the experiments were as follows: (1) Spirochaetes of louse-borne relapsing fever can survive and multiply in *Ornithodorus* for 134 days after the ticks had fed on a patient; (2) the spirochaetes of louse-borne fever cannot be transmitted to mice, guineapigs and man by the bite of such ticks; (3) none of the lice fed on patients suffering from tick-borne fever contained any spirochaetes, nor did any of the human beings inoculated with material from such lice acquire an infection with relapsing fever. *C. A. Hoare.*

EKZEMPLJARSKAJA, E. V. [**On the Chemotherapy of Tick-borne Relapsing Fever.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 4, 63–5. [12 refs.] [In Russian.]

The author records the result of tests on the treatment of experimental tick-borne relapsing fever, carried out with the following chemicals: (1) sulgin (sulphanylguanidine); (2) white streptocide; (3) acriquine; (4) triphenylbismuth; (5) fouadin concentrate (antimony III-bis-pyrocatechol—3·5-calcium disulphate); (6) aryl-fouadin No. 1 (phenyl antimony III-bis-pyrocatechol—3·5-sodium disulphate). Each compound was tested on a group of 5 guineapigs, while 15 animals served as controls. Inoculations were made intraperitoneally with the blood of a guineapig infected by the bites of *Ornithodorus papillipes* with a Pamir strain of spirochaetes. Treatment was initiated as soon as spirochaetes appeared in the peripheral blood of the animals. The Pamir strain produced four paroxysms of fever, the first of which lasted 2–6 days, the remaining 1–2 days each; the total duration of the disease being one month. The results of the experiments were assessed by the degree of parasitaemia during the paroxysms, which in the control guineapigs amounted to 30–50 spirochaetes per field of a thick film stained by Giemsa's method. In the groups of guineapigs treated with sulgin, streptocide and fouadin-concentrate the number of spirochaetes never exceeded 18–20 per field, while in those treated with aryl-fouadin only 12–14 were present at the height of the paroxysms. As regards acriquine and bismuth, the course of the infection in animals treated with these drugs did not differ in any way from that in untreated control guineapigs. *C. A. Hoare.*

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## YAWS.

DWINELLE, J. H. La campaña contra la frambesia de la Misión Sanitaria Americana de la Oficina de Asuntos Interamericanos. Valor de la penicilina en el tratamiento de la frambesia. [**Penicillin in the Treatment of Yaws.**] *Kuba.* Habana. 1947, Apr., v. 3, No. 4, 84–6.

This paper refers to treatment in Haiti where about 85 per cent. of the rural population are affected; here the problem is difficult because the standard of education is low and all instruction must be given verbally, and also, as elsewhere, improvement of symptoms results in absenteeism and neglect of further treatment.

Five hundred cases of yaws in the primary and secondary stages were divided into three groups for treatment by penicillin : (1) 200 were taken into hospital and given sodium penicillin, 40,000 Oxford units every 3 hours intramuscularly day and night for 4 days, to a total of 1,200,000 units. The results were spectacular ; joint pains disappeared in 24–48 hours, the plantar (crab) yaws became painless in 48–72 hours, the other lesions dried up in 24 hours and many of them were covered with epithelium in 4 days and were quite cured within a month. Biopsy material showed, when stained, numerous spirochaetes in the first 12 hours, few in 22 hours, and none after that. About half the patients had a rise of temperature to 100°–104°F. (38°–40°C.) 2–8 hours after the treatment was started (probably a Herxheimer reaction). (2) A second group of 151, not taken into hospital, were given calcium penicillin in peanut oil with 4·8 per cent. beeswax, 300,000 units per cc., one injection daily on two successive days to the same total as group 1, *i.e.* 1,200,000 units for adults, children less according to age (presumably each dose was 2 cc.). (3) A group of 149, also treated as outpatients and given the same dose as those of group 2, but in two injections on the same day at a 12-hour interval. The results in the last two groups are said to have been even better than in group 1 and there was the added advantage that there was no need for hospitalization. All were kept under observation for a year and there was no clinical relapse and the patients were, therefore, rendered non-infective, but the serological tests did not continue to give negative results. *H. Harold Scott.*

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## LEPROSY.

BARMAN, J. M. Absorción de los esteres etilicos y bencilicos del aceite de chaulmoogra administrado por via duodenal. [**Absorption of Chaulmoogra Derivatives administered directly into the Duodenum.**] *Rev. Argentina Dermatosifilologia.* 1947, Apr., v. 31, No. 1, 103–7, 1 fig.

The dosage of chaulmoogra oil administered intramuscularly is limited because of "local intolerance" ; *per os*, it causes gastric irritation and this route has, therefore, been practically abandoned. Since digestion and absorption of fatty substances take place in the intestine, the author has given the drug by duodenal tube, to by-pass the stomach. He estimated the faecal fat, total, neutral fats and fatty acids, before giving the drug and in the two motions after the administration. Of 11 patients so treated, nine showed a small increase in the fatty acids eliminated, in two only was there a marked increase in excreted fat, indicating, in the former, that the preparations used, the ethylic and benzylic esters, had been absorbed.

He next carried out experiments on dogs. They were kept without food for 18–24 hours ; then the thoracic duct was opened under anaesthesia and 20–30 cc. of the chaulmoogra preparation were passed by catheter into the duodenum. The times when the lymph began to be turbid, when it became quite milky, and when it cleared again were noted ; also the degree of lipaemia in the dogs and, it is stated, in the human subjects [but see below]. Two of the dogs died under the operation, one probably from the anaesthetic and one from injection of creosoted chaulmoogra by mistake. In the others, the lymph was milky in an hour or so and usually clear again in 3–5 hours. The results may be summed up by saying that the high fat-content of the lymph and increase in the blood fat showed that absorption from the intestine had been satisfactory. Examination of the liver and lungs showed fatty deposits there, indicating that absorption from the duodenum takes place, in part at

least, by the blood-stream. [Doubtless others will try this method. The present paper lacks important information ; thus, no mention is made of the dosage used in the human patients, nor of the type or stage of the disease ; again, after stating that estimation of the lipaemia would be made in the human cases during the period of absorption, this matter is not again referred to ; finally, the number of cases is very small.] *H. Harold Scott.*

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## HELMINTHIASIS.

BUCKLEY, J. J. C. **A Helminthological Survey in Northern Rhodesia.** *J. Helminthology.* 1946, v. 21, No. 4, 111–74, 7 maps. [17 refs.]

The author's survey of Northern Rhodesia follows the same general lines as BLACKIE's survey of Southern Rhodesia [see this *Bulletin*, 1932, v. 29, 401] made 16 years previously. Both surveys occupied about 10 months, but Northern Rhodesia has an area almost twice as great as its southern counterpart, so that the amount of time necessary for travelling reduced that available for laboratory examinations. It was necessary, therefore, to choose between covering a large area in a superficial manner or a small area more thoroughly. The latter course having been decided upon, it was only found possible to survey about one-fifth of the total territory. The survey was undertaken with a view " to estimating the importance of these infections in relation to the health of the native population, hence indirectly to that of the European community ; and also for the purpose of studying the conditions which influence, adversely or favourably, the propagation and spread of helminth parasites in Northern Rhodesia ". Hitherto, accurate information was lacking regarding helminth infections, although it was generally considered that they were probably more prevalent than was previously believed, particularly as regards hookworm and bilharziasis ; interest in the latter disease was centred on its peculiar distribution, its sub-clinical character, and problems concerning its accurate diagnosis. *Ascaris lumbricoides* was thought to be widespread, while *Trichuris trichiura, Enterobius vermicularis, Strongyloides stercoralis, Taenia solium, T. saginata, Hymenolepis nana* and *Acanthocheilonema perstans* were known to occur, the latter being the only filarial parasite definitely recorded.

The area surveyed comprised the north-western half of the plateau, and an account is given of the climate, population ,and the agricultural practices and foodstuffs of the inhabitants, in so far as these are likely to affect the parasitic helminth fauna. Wild game is plentiful and the African is not averse to eating any part of the carcass, a point to be borne in mind when one is making routine laboratory diagnoses ; thus, the presence of ova of *Rhabditis, Spiruridae,* Amphistomes, *Fasciola hepatica* and certain operculated Trematode eggs found in human excretions, are considered to have probably been pseudo-infections.

Six districts in all were examined and in each district a suitable Location camp and field laboratory were set up ; villages within about a 10-mile radius were investigated, a total of 25 Locations being surveyed in all. In each area, specimens of faeces and of urine were collected from as representative a proportion of the inhabitants as possible. For the examination of this material, standard concentration methods, similar to those employed by Blackie (1932), were adhered to throughout. As many thick blood films and " skin snips " as possible were examined for the presence of microfilariae, but the native population

did not prove very co-operative, so that the number of persons examined for evidence of filariasis (459 blood examinations and 122 skin examinations) was less than the number for intestinal (2,575) or urinary infections (2,617). No mention is made of the arthropod vectors of filariasis occurring in the various Locations, but the species and distribution of aquatic molluscs likely to be associated with the spread of schistosomiasis were investigated in all the areas surveyed.

The reviewer has selected the following points from the author's description of individual helminth infections, but many of these observations can only be evaluated properly when considered in conjunction with the maps accompanying the paper.

*Hookworm infections. Necator americanus* was the only species encountered amongst a total of 235 hookworms collected from 20 positive cases. In 88 per cent. of a small series of treated persons, the number of worms recovered was less than 10 and in only one case did it exceed 50. Locations having a high incidence of 50 per cent. and over were associated with relatively low altitude or with different agricultural practices. As regards altitude, the author considers that the factor here involved must be temperature, since, according to available records, there is no correlation between rainfall and altitude. As regards agriculture, evidence is brought forward to show that the nature of the crop and its distance from the village may have an important influence on hookworm dissemination; thus cassava gardens, which are usually near villages, are associated with heavy infestation, whereas millet gardens are usually distant from the villages and are associated with a low incidence, probably because of a more scattered distribution of faecal deposits. The author considers it probable that hookworm is the agent responsible for famine lassitude, since in times of famine the local African's capacity for work diminishes out of all proportion, and even the stimulus to produce more food is insufficient to counteract this lassitude [similar cases of famine lassitude, however, have been reported from other countries where hookworm is not known to exist].

*Strongyloides* spp. *infections.* Both *S. fülleborni* and *S. stercoralis* occurred in the area surveyed, and tended to parallel hookworm infections as regards incidence and geographical distribution in regions where they were co-endemic.

*Ascaris lumbricoides infections.* Unlike the preceding parasites, this helminth was *not* found to be widespread in the area surveyed and had a dissimilar geographical distribution. The author enters into a careful discussion of the reasons for this distribution and believes that, although many causes are at work, congestion of population is the ruling factor.

*Filarial infections.* Four hundred and fifty-nine night films revealed embryos of *A. perstans* in 5·4 per cent. of the cases, and 151 day films showed them in 6·6 per cent.; it is evident that this is an endemic infection in some parts of Northern Rhodesia. Microfilariae of *W. bancrofti* were demonstrated in the blood of only 3 persons, in none of whom the chance of having acquired the infection elsewhere than in Rhodesia could be excluded. Definite clinical evidence of this infection in Northern Rhodesia is also lacking and the condition known as "thick leg" is believed to be non-filarial in origin [see this *Bulletin*, 1942, v. 39, 199; 1946, v. 43, 1186]. Microfilariae of *Loa loa* were not found in the blood specimens examined, although the presence of this filaria has been reported by DE MEILLON (personal communication) in the blood of six Africans from Northern Rhodesia. No onchocerciasis was found in skin snips from 122 Africans.

*Bilharzia infections. Schistosoma haematobium* and *S. mansoni* are probably the most important helminth parasites occurring among the human population in N. Rhodesia, and particular attention was paid to the incidence and distribution of these parasites and of their molluscan hosts, the results being summarized in the maps illustrating the paper. In the case of *S. haematobium,*

the percentage rate of infection varied in different Locations from zero to over 60 per cent. No difference was observed in the infection rate among males and females, but children were more often infected than adults—45·9 per cent. as compared with 20·6 per cent. In 256 positive children haematuria was observed in 41·4 per cent., while in 123 positive adults it was seen in only 26 per cent. Natural infections with cercariae of the human type were found in *Physopsis globosa* collected in one Location, and guineapigs exposed to infection from the snails subsequently showed the presence of adult schistosomes, only males being found at the autopsy. Attempts to infect this species of snail, as well as *Bulinus natalensis* and *B. forskali*, yielded inconclusive results. *P. globosa* or *P. africana* were present in every Location where *S. haematobium* was endemic; whereas in districts where a low incidence of this helminth was observed, these two species were notably absent. It may be concluded with some confidence, therefore, that these species are the vectors in the area surveyed. Both species of snails were essentially inhabitants of small streams, and tended to be scarce or absent in large rivers, lakes or swamps.

In the case of *S. mansoni*, the incidence also varied in different Locations from zero to 61 per cent. but, with one exception, Locations with high *S. haematobium* incidence never coincided with those having a high *S. mansoni* incidence. Unlike *S. haematobium*, the difference between the infection rates in adults and children was not significant. The sex incidence also differed, for a higher proportion of both adults and children, 23·2 and 32·7 per cent. respectively, were found infected in the female group, as compared with the male group, 13·5 and 20·4 per cent. The author notes that microscopic examination of faecal specimens at Niamkolo, where the infection rate was highest and *S. mansoni* eggs seemed to be most numerous in the stools, revealed no signs of blood or mucus. This finding supports the view put forward later in the paper that, "There is a trend of opinion in recent literature on schistosomiasis to the effect that in endemic areas where gross manifestations of the disease are not apparent, it may nevertheless exist in a sub-clinical form of great insidiousness." Natural infections with cercariae of the human type were found in 22 per cent. of *Biomphalaria pfeifferi* examined and this species is probably the vector of *S. mansoni* in the area surveyed; evidence regarding the closely allied *B. tetragonostoma* was inconclusive. Both species of snails, as in the case of *S. haematobium* vectors, occurred most commonly in small streams. The explanation of the scarcity of molluscan hosts of both species of schistosomes from large areas of water, such as lakes and swamps, is discussed and it is suggested that natural enemies, particularly birds, may be acting as biological controls.

Returning to the subject of sub-clinical infection in schistosomiasis the author points out that the accurate diagnosis of such infections by laboratory methods is of great importance, and he puts forward the view that "While it is admitted that this is but a brief and inadequate discussion of a complex problem it is desired to emphasize that there are some grounds for believing that a negative diagnosis by the microscopical method, at least of *S. haematobium*, does not necessarily imply freedom from the infection, and that this method should not be relied upon entirely but should be supplemented by serological tests, especially in the case of adult individuals, should there be any suspicion or history of bilharzia infection."

[This is an important paper which should prove of great practical value to all who are interested in helminthiasis and especially those concerned with the control of helminth infections in N. Rhodesia. The reviewer has dealt with some of the information it contains, but the concise nature of the report does not lend itself to further summary and it should be consulted in the original.]

*R. M. Gordon.*

CANÇADO, J. R. Contribuição ao estudo da esquistosomiase mansônica no Brasil. Dados relativos à sua distribuição no estado de Minas Gerais. [**A Study of *Schistosoma mansoni* Infection in Brazil. Notes on its Distribution in the State of Minas Gerais.**] *Rev. Brasileira Med.* Rio de Janeiro. 1947, Jan., v. 4, No. 1, 31–5, 1 fig. [36 refs.]

*S. mansoni* infection is only slightly endemic in the north-east of Brazil, as records show: on the other hand, a large part of the State of Minas Gerais is strikingly infested with this serious helminthic disease.

From data, as yet incomplete, which the author is collecting, he can state with certainty that schistosomiasis is present in a number of towns in Minas, listed in the text.

The disease is rare or non-existent in the south of Minas and is unknown throughout the whole of the Minas Triangle (*Triângulo Mineiro*).

In 81 persons examined for helminths by SETTE COTTA in Usina Ana Florência (Ponte Nova, Minas) only 5 had negative stools and 31 had *S. mansoni* ova when the faeces were examined by direct smears, without concentration.

*H. J. O'D. Burke-Gaffney.*

CULBERTSON, J. T., ROSE, H. M. & OLIVER-GONZALEZ, J. **Skin Tests in Schistosomiasis Mansoni with Antigen from Heterologous Worms** (*Pneumoneces*; *Planaria*). *J. Infect. Dis.* 1947, Mar.–Apr., v. 80, No. 2, 218–21.

Earlier workers quoted by the authors have used, for the diagnosis of human schistosomiasis, antigen derived from *Schistosoma spindale* and the distomes *Fasciola hepatica* and *Eurytrema coelomaticum*. Other species of trematodes may contain antigens suitable for the same purpose. The authors here record work done with antigens derived from cercariae of *S. mansoni* and from the adults of *Pneumoneces medioplexus* (a distome from the lungs of grass frogs) and *Planaria maculata* (a non-parasitic Turbellarian trematode). The results of skin tests done with extracts of *P. medioplexus* were reported earlier by CULBERTSON and ROSE [this *Bulletin*, 1943, v. 40, 471].

The washed and dried trematode material was powdered, extracted for 24 hours in water and centrifuged. The extract was mixed with an equal volume of 1 per cent. phenol in 1·7 per cent. salt solution, to yield the solution used for the skin tests. The dilutions of the antigen used were: *S. mansoni* cercariae 1 : 10,000, *P. medioplexus* adult 1 : 1,000, *P. maculata* 1 : 200. The persons tested were all native male Porto Ricans, aged 20 to 35 years, all of whom had eggs of *S. mansoni* in their stools. None of the 12 controls had ever lived in an endemic centre of schistosomiasis. The skin tests were done by injecting subcutaneously into the volar surface of the forearm 0·1 cc. of the antigen dilutions quoted above. As a control, 0·1 cc. of phenolized saline was injected. Ten persons with schistosomiasis were tested, each with the three extracts. Eight of these showed an immediate reaction to the *Schistosoma* extract, 7 to the *Pneumoneces* extract and 9 to the extract of *Planaria maculata*. One person did not react to any of the antigens. None reacted to the control injections. The weals obtained are illustrated. None of the 12 control persons reacted to the extracts of *Pneumoneces* and *Planaria*. The extract of *S. mansoni* had been previously tested by one of the authors on 40 persons without schistosomiasis and none of them was positive to it.

The extract of *S. mansoni* contained worm substance at a dilution of 1 : 10,000, but dilutions of the extract of *Pneumoneces* of 1 : 2,500, 1 : 5,000 and 1 : 20,000 were injected into 2 persons infected with *S. mansoni* and each dilution gave a positive reaction. Dilutions of the *Planaria* extract of 1 : 500 and 1 : 1,000 also gave positive reactions.

The authors conclude that a common antigen occurs in the three species of trematodes, but in different quantities. *Pneumoneces medioplexus* contains at least 10 to 20 times as much of it as *Planaria maculata* does, because the *Planaria* extract failed to produce positive reactions at dilutions higher than 1 : 1,000, while the *Pneumoneces* extract still produced them at a dilution of 1 : 20,000. The cercariae of *S. mansoni* contain " vastly larger amounts " of the common antigen. One of the authors found that it can elicit a reaction even when it is diluted " up to 200,000 times " [OLIVER-GONZÁLEZ and PRATT, this *Bulletin*, 1946, v. 43, 348]. The authors think that the antigens used for this work would probably produce positive skin reactions in patients with most, if not all, trematode infections. They obtained, in fact, an immediate reaction with the *Pneumoneces* antigen in a patient infected with *Clonorchis sinensis*. They suggest that planarians, which are easily cultivated without any need for rearing molluscan hosts, offer unusual opportunities for the preparation of antigens for skin tests for the study of schistosomiasis. *G. Lapage.*

ERFAN, M. **Hepatic Bilharziasis.** *J. Trop. Med. & Hyg.* 1947, June, v. 50, No. 6, 104–9, 2 figs.

In hepatic schistosomiasis, obstruction and penetration of the portal radicles by schistosome eggs, deposited by embolism through the mesenteric veins, result in inflammatory reaction with subsequent fibrosis, secondary splenomegaly and ascites, although toxins and hypoproteinaemia may play some part in producing these secondary phenomena.

In the earlier stage, the liver is smooth, enlarged and congested, with cellular granulation tissue rich in histiocytes and eosinophils around the eggs deposited in and around the portal venules ; sometimes coupled worms are found, with an intense reaction surrounding them. The liver parenchyma shows no gross alterations. In the stage of fibrosis, the liver becomes normal or reduced in size, its surface sometimes nodular, and its capsule thickened. Cords of scar tissue, containing degenerated eggs, compress the portal branches, and the liver cells are commonly atrophied. The Kupffer cells show schistosomal pigment. Eggs are found in 100 per cent. of livers in stage one and in 75 per cent. of livers in stage two ; *S. mansoni* infections are four and a half times as common as *S. haematobium* infections in Egyptian hepatic schistosomiasis. The spleen becomes uniformly enlarged, with patchy perisplenitis and adhesions. The splenic vein is thickened and tortuous, with thromboses in 2·5 per cent. of cases. In the earlier stages, the organ is congested with medullary hyperplasia, but later the proliferated reticulum is replaced by fibrous tissue and the Malpighian bodies become atrophied and fibrosed.

Clinically, schistosomiasis shows an early stage of cutaneous lesions at the site of cercerial invasion ; secondly, fever, urticaria and eosinophilia ; and thirdly urinary or intestinal symptoms with later visceral complications such as hepatic cirrhosis. In the earlier stages of hepatic involvement, there are abdominal discomfort, enlargement of the liver and sometimes of the spleen, eosinophilia, and eggs to be found in the stool. In the stage of fibrosis, the liver shrinks and becomes hard and irregular, there are loss of weight, anaemia, and later ascites, oedema of the legs, and dilatation of veins over the epigastrium and lower part of the chest. Haematemesis and jaundice are rare. The stools are often negative in the later stages, but liver puncture may reveal eggs and place the diagnosis beyond question. The course of the disease is chronic and may extend over years. The condition is to be differentiated from malaria, leukaemia, syphilis, neoplasm, or other causes of hepato-splenomegaly.

Treatment with antimony in the early stages will prevent cirrhosis, but the drug should be used with caution in the later stages. A good diet and the

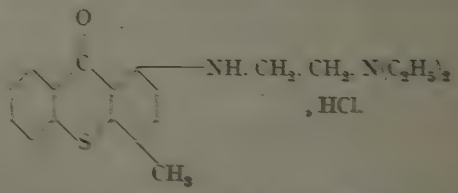
treatment of associated conditions, such as anaemia, malaria, or pellagra, are important. Ascites may require mercurial diuretics and paracentesis. Splenectomy may be necessary for the mechanical disability of a grossly enlarged spleen. *F. Murgatroyd.*

LÔBO, R. Do colo sigmóide na esquistossomose de Manson-Pirajá da Silva. [**The Descending Colon in Schistosomiasis Mansoni.**] *Publicações Médicas.* São Paulo. 1947, Feb.–Mar., v. 18, Nos. 7/8, 45–8.

The symptoms of infestation by *Schistosoma mansoni* are varied according to the migration and situation of the worm, the site of deposit of ova, and the toxic and allergic effects. The author lays stress on the value of thickening of the sigmoid flexure felt on the left side of the abdomen after evacuation of the bowel. At times the thickening is painful, but usually is not, even on deep pressure. He found it in 48 out of 56 such patients and regards it as sufficiently frequent as to have characteristic diagnostic value. He gives notes of four such cases. *H. Harold Scott.*

WOOD, D. R. **Observations on the Pharmacology of Miracil, a New Chemotherapeutic Agent for Schistosomiasis.** *Quart. J. Pharm. & Pharmacol.* 1947, Jan.–Mar., v. 20, No. 1, 31–7, 4 figs.

Miracil is the hydrochloride of 1-methyl-4-diethylaminoethylaminothioxanthone




It has been synthesized by MAUSS and shown by KIKUTH and GONNERT to be active against experimental infections of *Schistosoma mansoni* in mice and monkeys. By mouth, single doses of 1·0 gm. per kgm. or 10 daily doses of 125 mgm. per kgm. were tolerated by mice. Rabbits tolerated single oral doses of 150 mgm. per kgm. but were killed by 4 such daily doses. When given intravenously, the LD 50 for mice was 45 mgm. per kgm.; in rabbits, single doses of 20 mgm. per kgm. were tolerated, but larger doses caused convulsions within three minutes. The convulsions resembled those due to pilocarpin; some animals showed marked head retraction with extended limbs. Histological examination of a rabbit and several rats which died from miracil showed only very slight toxic changes of doubtful significance. Repeated daily oral doses of 20 mgm. per kgm. retarded the growth of rats, but doses of 20 mgm. per kgm. had little effect on the growth, haemoglobin concentration of the blood or total leucocyte count. When injected intravenously into anaesthetized cats or rabbits doses larger than 5 mgm. caused a fall in blood pressure apparently due in part to a direct action on the heart, and in part to peripheral vascular dilation. There was no significant action on respiration, or spleen volume in doses of 1 to 10 mgm. or on the rat phrenic-nerve diaphragm preparation. [In these last cases the author does not specifically state whether 1 to 10 mgm. represents a total dosage or a dose per kgm.] *F. Hawking.*

DAKIN, W. P. H. & CONNELLAN, J. D. **Asiatic Schistosomiasis : an Outbreak in the Royal Australian Air Force.** *Med. J. Australia.* 1947, Mar. 1, v. 1, No. 9, 257–65. [31 refs.]

A unit of 565 men spent 16 days on Leyte, in the Philippines, where they bathed freely in the Bislig River, later found to be heavily infested with *Schistosoma japonicum.* Two weeks later, fever, urticaria, joint pains, and cough developed in some of the men, and within another month it was realized that many men had developed Asiatic schistosomiasis. When yet further cases of latent infection were discovered, and after unsuccessful treatment of some men with Fouadin, the unit was returned to Australia for more thorough investigation and treatment.

A diagnosis of schistosomiasis was made in 174 men either by discovery of ova in their stools (using a technique for sedimentation in 0·5 per cent. glycerin in water, modelled on that recommended by the U.S. Commission on schistosomiasis) or on a positive complement deviation test ; 53 others were treated empirically with Fouadin, solely because they had eosinophilia. Of the 174 declared cases 72 (41 per cent.) were symptomless ; the others suffered an initial influenzal type of illness of one to three weeks' duration, between 24 and 65 days after first infestation. All were then apparently restored to normal health, but later some of them suffered from a variety of manifestations not constituting a clear-cut syndrome. Ova were hard to find except in very heavily infected cases, and repeated examinations were necessary. Sigmoidoscopic examination showed no pathognomonic features and did not materially aid in diagnosis. Marked eosinophilia was usual during the early months of infestation, but it diminished spontaneously later ; its decline was not indicative of cure.

The complement-deviation test was performed with a cercarial (*S. spindale*) antigen, prepared from the livers of *Planorbis exustus* in 1928 and refrigerated since. The test was done on 560 of the men, 10 to 12 months after exposure to infection, and fixation of three or more M.H.D. of complement constituted a positive reading ; 169 men gave positive complement-deviation tests, and 139 of these were known to be, or to have been, infected by the recovery of eggs from the stools. Only five men from whom ova had been recovered failed to give a positive complement-deviation test, and no satisfactory explanation could be advanced for their failure to do so, as all were passing ova at the time of the test. In 30 cases, a positive complement-deviation test was unsupported by the identification of eggs in the stools ; 22 of these 30 had marked eosinophilia (over 20 per cent.) and presented symptoms suggestive of infection ; they had already been treated with Fouadin; the remaining eight of the 30 were symptom-free and had no marked eosinophilia. It is suggested that the positive complement-deviation in these cases was due (1) to infection with cercariae which failed to develop further, or (2) to the development of worms of one sex only, or (3) to early spontaneous death of mature worms.

Among 80 control sera no " false-positive " reactions were found, and it is concluded that the complement-deviation test was both sensitive and specific, a positive result indicating a need for treatment. How long the reaction remains positive after treatment was not established, but it did so for months after apparently successful treatment in certain cases, although the titre declined.

Treatment with Fouadin is easy to give, and non-toxic ; but of 177 men (not all microscopically confirmed cases) so treated 103 (58 per cent.) subsequently passed ova in the stools. The results, therefore, were poor.

Potassium antimony tartrate was then given, a dosage of two grammes being administered intravenously in 22 injections over a period of three to three and a half weeks. The results of this treatment are not yet available, but will be published later. [For details of the complement fixation tests, see WILLIAMS, this *Bulletin* 1947, v. 44, 599.] *A. R. D. Adams.*

LEAVITT, S. S. & BECK, O. H. **Schistosomiasis Japonica. A Report of its Discovery in Apparently Healthy Individuals.** *Amer. J. Trop. Med.* 1947, May, v. 27, No. 3, 347–56.

The staff of a military hospital in Mindoro had previously been stationed in an area of Leyte, which was later discovered to be heavily infected with *Schistosoma japonicum.* The diagnosis of infection, in patients who were parasitized there, rested on the recovery of ova from their stools and the recognition, proctoscopically, of characteristic lesions in the recto-sigmoid and sigmoid mucosae. These lesions were minute, sharply circumscribed areas of distended venules forming a stellate pattern and surrounded by healthy mucosa; some of the lesions were ulcerated, others had a greyish or yellow central pustule up to the size of a pin's head; scrapings, where these were made, contained ova. It occurred to the hospital staff that they themselves might also be infested, when a ward attendant was found to have Asiatic schistosomiasis. Thereafter, a detailed survey showed 34 of the 177 hospital workers who had been at risk to be infected, as judged by stool examinations and proctoscopy. Few, if any, of these had symptoms and signs unequivocably attributable to their infections, and all 34 were treated with a course of Fouadin without any interruption of their normal duties. On re-examination proctoscopically two to four weeks later, all but two men were clear of active lesions. One of these two continued to improve, but the other failed to do so and was evacuated. These cases show that asymptomatic schistosomiasis may escape notice unless specifically sought for, and that it readily yields to Fouadin treatment in the early stages.

[It appears a little premature, in the reviewer's opinion, to accept "cure" of these cases on the evidence so far available.] *A. R. D. Adams.*

WATSON, C. W., MURPHEY, F. & LITTLE, S. C. **Schistosomiasis of the Brain due to** *Schistosoma japonicum.* **Report of a Case.** *Arch. Neurology & Psychiatry*, 1947. Feb., v. 57, No. 2, 199–210, 3 figs. [Refs. in footnotes.]

After reviewing the literature on the subject the authors record details of a case of cerebral schistosomiasis. The patient, a soldier, probably became infected in Leyte, the Philippines, with *Schistosoma japonicum* on December 12th, 1944. A couple of weeks later he developed indefinite symptoms and fever with diarrhoea and vomiting. In April 1945, 109 days after exposure to infection, he was hospitalized on account of continuing fever, diarrhoea and abdominal cramps. Stool examination showed the presence of ova of *S. japonicum*, and ten 1 grain injections of emetine hydrochloride were given. By the end of June 1945, he had become emaciated, suffered abdominal cramps, and had distended superficial veins over the lower abdomen; and he had suffered ten convulsive seizures by this time. The numerous investigations detailed included electroencephalography and ventriculography; repeated stool examinations failed to reveal the presence of schistosomal ova at this time.

As there was conclusive evidence of an increasing lesion in the left parieto-temporal region, with intracranial calcification in the left temporal horn, craniotomy was performed. The dura was tense, and could be opened only after spinal puncture to reduce intracranial tension. An area of discolouration and induration studded with multiple tiny white nodules was seen in the posterior third of the superior temporal gyrus; at one point it invaded the dura, and it seemed to extend subcortically. The mass was five to six cm. in diameter. It was incised, but could not be removed as it involved the speech centre; a subtemporal decompression was done. In a biopsy specimen were seen bodies, suggestive of ova, in focal necrotic areas in a zone of eosinophils and surrounding

gliomatous proliferation. Stained sections showed many ova of *S. japonicum*. In July, after the operation, a course of Fouadin was given.

As evidence of localized cerebral damage persisted, and the seizure continued, another craniotomy was done in November ; the lesion previously seen was then found to have gone, but to have been replaced by scar tissue with small white hard lesions in it. A considerable subcortical scar was detected 5 cm. behind the cortical lesion. This latter could not be removed without danger to the speech area, but the superficial scar tissue was excised. Section showed large numbers of *S. japonicum* ova. The patient's general condition four weeks later —the time of writing—had much improved, and the convulsive seizures had become less frequent and less severe. *A. R. D. Adams.*

i. McMullen, D. B. **The Control of Schistosomiasis Japonica. I. Observations on the Habits, Ecology and Life Cycle of** *Oncomelania quadrasi*, **the Molluscan Intermediate Host of** *Schistosoma japonicum* **in the Philippine Islands.** *Amer. J. Hyg.* 1947, May, v. 45, No. 3, 259–73, 5 figs. [15 refs.]

ii. —— & Graham, O. H. **II. Studies on the Control of** *Oncomelania quadrasi*, **the Molluscan Intermediate Host of** *Schistosoma japonicum* **in the Philippine Islands.** *Ibid.*, 274–93. [38 refs.]

iii. —— & Ingalls, J. W. **IV. The Effect of various Chemicals on the Cercariae of** *Schistosoma japonicum*. *Ibid.*, 294–8.

The observations and experiments recorded in these three papers were made in the Philippine Islands and are from the Commission on Schistosomiasis, Commission on Tropical Diseases, Army Epidemiological Board, Preventive Medicine Service, Office of the Surgeon General, Washington.

i. In order to attack the problem of exterminating the molluscan intermediate host, in this case *O. quadrasi*, intelligently it is important to know something of its life-cycle and habits. For this purpose, the author carried out his work in the Leyte Valley, an extensive coastal plain on the east side of the Island of Leyte, during the months of May to October, at a time usually referred to as the " dry season ", although during most of the period there is an average rainfall of about 6 inches per month. Snails were present during all of this period. *O. quadrasi* is an amphibious species and is found living under variable conditions in scattered colonies, often separated from each other by extensive areas not inhabited by this species. Their main *foci*, so far as contact with the human population is concerned, seem to be in places kept wet in the process of rice cultivation, but it would appear that as long as the area is under cultivation, there are few, if any, snails present, and it is only when the plot is abandoned for a time that the colony once more becomes populous. For a more detailed study of the habits of the snail, four collecting stations were started in the endemic area of schistosomiasis in the Leyte Valley. Collections were made at each station every two weeks, except during parts of July and August, and a total of 16,447 snails were collected and measured to the nearest 0·25 mm. The author's observations and conclusions are summarized as follows :—

" 1. Eggs of the snail, *Oncomelania quadrasi*, are described.

" 2. The egg probably hatches about 2 weeks after being laid. The newly-hatched snails measure about 0·50 millimeter in length.

" 3. Under ideal conditions the snail grows at the rate of about 0·25 millimeter per week. The shortest time required to reach maturity is 4 to 5 months. In areas where conditions are sometimes adverse, the time required would be at least a month longer.

" 4. Some young snails appeared during the entire period of observation at all of the collecting stations. At three of the stations large broods of young were found.

" 5. At one of the stations it has been shown that the adult snails lived for at least 5 months. At the end of the period of observations there was no evidence that this group was dying out, and it had not had a major reproductive period. It would appear, therefore, that the snail probably has a life span covering at least 1 year.

" 6. The smallest snails with mature cercariae, obtained in the field, measured 3·00 millimeters in length. These snails were at least 10 weeks old and must have been infected shortly after hatching, since the development of *S. japonicum* in *O. quadrasi* requires 11 weeks under laboratory conditions.

" 7. Data from the crushed snails indicate that penetration by the miracidium is not confined to the very young.

" 8. At one station where the incidence was relatively high, there was some evidence that the rate of infection decreased during the dry season."

ii. Owing to its establishment in a large and varied animal reservoir, the control of schistosomiasis caused by *S. japonicum* presents difficulties not encountered in the control of *S. mansoni* and *S. haematobium* since, for all practical purposes, the adult stages of the latter worms are confined to the human host. The authors consider that, under wartime conditions, impregnated clothing and protective ointments offer very considerable protection [WRIGHT, 1945, unpublished report, and FERGUSON *et al.*, this *Bulletin*, 1947, v. 44, 435]. The proper chlorination of water renders it safe for drinking and bathing, but so far no cercaricide has been found which is effective in large bodies of natural water, and the elimination of the molluscan host, *O. quadrasi*, remains the most practical means of control. Snails of this species are amphibious and operculated, and are therefore not as easily exposed to toxic chemicals as are the aquatic non-operculated snails.

As a result of the observations recorded in the previous paper, it was thought that a chemical used for the control of this snail should have the following properties : (1) it should be usable as a dust or a spray, depending on existing conditions ; (2) it should stick to the vegetation, but it is also important for some of it to get down to the surface of the soil ; (3) it should not injure vegetation ; (4) it should be relatively non-toxic to vertebrates ; (5) its action should be such that the snail will not evade the chemical ; (6) it should also kill the eggs. The authors tested 19 different materials. At the beginning, a few laboratory tests were made, but these were later abandoned in favour of the much more reliable field tests which were carried out, in an intensely infested area with up to 100 or more snails per square foot, on plots of ground or in prepared ponds. The authors summarize the results they obtained as follows :—

" 1. The best time to use chemicals in controlling *O. quadrasi* is during a relatively dry season in which the snails are still active.

" 2. Nineteen chemicals have been tested for toxicity in experiments with this snail.

" 3. In testing their toxicity 3 different types of plots were devised. A small grass plot, enclosed in a dehydrated-food tin served for screening tests. The minimum lethal doses were determined on 25 square feet of natural habitat or in artificial pond plots containing 25 square feet.

" 4. *Bug-getta* [which contains calcium arsenate], formaldehyde, para-dichlorobenzene, dichloro-diphenol-trichlorethane [DDT], Bordeaux mixture, copper cyanamide, slaked lime, CC2, and 2-phenol-cyclohexanol did not give satisfactory results.

" 5. Copper sulphate, copper carbonate, copper guanylurea, calcium arsenate, and calcium cyanamide killed the snails when applied at the rate of 12 pounds per 1,000 square feet.

" 6. Paris green killed the snails when applied at the rate of 5 to 6 pounds per 1,000 square feet.

"7. Dinitro-ortho-cyclohexylphenol and its dicyclohexylamine salt were effective at the rate of 2 pounds per 1,000 square feet. The dinitro-secondary butylphenol is considered too dangerous for ordinary use.

"8. All of the chemicals except the two best dinitro compounds injured the vegetation when applied in sufficient quantity to kill the snails.

"9. The cost varies from $0.54 to $5.40 per 1,000 square feet, with the different chemicals, when areas are treated that are heavily overgrown with grass. With the chemicals applied as dusts the amounts probably could be greatly reduced by removing a large portion of the vegetation.

"10. Best results would be obtained if chemical control was combined with drainage and removal of the taller vegetation. Good farming practices and drainage similar to that used in mosquito control would be essential."

[Part III of this series has not yet appeared in print.]

iii. Although no satisfactory method is known for killing cercariae in natural bodies of water, the cercaricidal effects of some substances have been demonstrated [HASSAN, this *Bulletin*, 1932, v. 29, 43; PENSO, *ibid.*, 1937, v. 34, 398; KRAKOWER, *ibid.*, 1941, v. 38, 376]. Chemicals effective against both the intermediate host and the cercariae would have obvious advantages, and the authors in their experiments used 10 chemicals which had already been tested in the control of *O. quadrasi*; but they point out that chemicals with only cercaricidal powers might be used as temporary control measures. The tests were carried out by exposing the cercariae to solutions of the various chemicals in the laboratory, and also by placing vessels containing live cercariae in a plot of ground and subsequently dusting a known area of the plot with a known amount of the chemical. It was observed that if infected *O. quadrasi* were kept in water in containers, the discharged cercariae at once came to the surface film and remained attached to it; if, as appears probable, they also attach themselves to the surface film in natural bodies of water, this habit might render them particularly vulnerable to surface dust. The following is the authors' summary:—

"1. Ten chemicals that had been used in experiments on the control of *Oncomelania quadrasi* have been tested for their cercaricidal powers.

"2. Calcium arsenate, copper carbonate, copper cyanamide, copper guanylurea, and Paris green in concentrations up to 100 p.p.m., had no observed effect on the cercariae of *S. japonicum*.

"3. Copper sulphate had no observed effect on the cercariae at 10 p.p.m., but a concentration of 100 p.p.m. killed all of them in 10 minutes.

"4. Dinitro-2-butylphenol was not effective at 10 p.p.m., but all cercariae were killed in 3 minutes when exposed to 100 p.p.m.

"5. Dinitro-ortho-cyclohexylphenol, 10 p.p.m., killed 60 per cent. or more of the cercariae in 15 minutes. With 100 p.p.m. nearly all cercariae were dead after 1 minute; all were dead after 15 minutes.

"6. In two experiments with the dicyclohexylamine salt of dinitro-ortho-cyclohexylphenol, 10 p.p.m. killed all the cercariae in 3 minutes. In a third experiment, however, two cercariae survived 15 minutes of exposure. At 100 p.p.m., 99 to 100 per cent. of the cercariae were killed within 1 minute, and all were dead in 15 minutes. When used as a dust, at the rate of 1 pound per 1,000 square feet, all cercariae were killed in the test vials after 15 minutes of exposure.

"7. CC2, a Chemical Warfare Service product whose composition is 'secret', was not tried in solutions of known concentrations. When applied as a dust at the rate of 6 pounds per 1,000 square feet, it killed all cercariae in 5 minutes."

*R. M. Gordon.*

SMYTH, J. D. **The Physiology of Tapeworms.** *Biol. Reviews.* 1947, July, v. 22, No. 3, 214–38, 1 fig. [Numerous refs.]

CHAUDHURI, R. N, & MUKERJI, A. K. **Death following Administration of Tetrachlorethylene.** *Indian Med. Gaz.* 1947, Mar., v. 82, No. 3, 115–16.

Tetrachlorethylene is popular in the treatment of hookworm disease because of its low cost, low toxicity and high efficacy : and although toxicity has been reported, usually in the form of a temporary narcotic effect, and in at least two cases, in the form of coma [this *Bulletin*, 1942, v. 39, 7], a fatal result does not appear to have been recorded.

The patient in the present case was a street beggar, aged 30 years, who was very emaciated (he only weighed 70½ lb.) and had marked oedema of the legs and feet. He complained of pain and a burning sensation in the epigastrium for one year, together with occasional vomiting and diarrhoea.

Full laboratory examinations were made, and apart from some anaemia the principal finding was the presence of 1,100 hookworm ova per cc. of stool. The diarrhoea was stopped after a week's treatment with sulphaguanidine (2 gm. every four hours) and multivitamin tablets (2 twice daily). The patient was then put on haemosan (2 tablets three times daily) and magnesium trisilicate (dose not stated, but " thrice daily after meals "). On the sixth day of the latter treatment, he was given 3 cc. of tetrachlorethylene shaken in an ounce of sodium sulphate mixture (containing 4 drachms of sodium sulphate) at 7.30 a.m. A little more than 2 hours later, he was drowsy (a not unusual effect of the drug) and he had abdominal pain and vomited once ; the pain increased, and in the afternoon he was given 1/100 grain of atropine, 2 cc. of somnofen and an intravenous infusion of 50 cc. of 25 per cent. glucose. There was no improvement, the pulse became feeble, and in the evening, the patient was given an intravenous drip of normal saline with 5 per cent. glucose, together with coramine injections every four hours. The patient's condition continued to deteriorate and he died next morning.

The principal autopsy findings were some haemorrhagic fluid in the abdominal cavity, scattered punctiform haemorrhages in the gastric mucosa, and deep congestion of the mucosa of the small intestine, increasing in intensity from the middle third of the jejunum to the lower part of the ileum, which looked almost blackish. The liver was small, pale and soft, with an indistinct pattern. The diagnosis was given as acute haemorrhagic enteritis.

The authors discuss the pharmacology of tetrachlorethylene and note that the absence of reported deaths with its use is correlated with its low rate of absorption in the absence of alcohol or fatty substances. They quote a number of cases in the literature in which symptoms of intoxication followed even therapeutic doses : but all of these recovered.

The extreme malnutrition of the patient is stressed and it is suggested, in the absence of signs of specific aetiology, that the chronic diarrhoea was a " nutritional diarrhoea " ; and that the small intestine, thus involved, was especially vulnerable to the effects of tetrachlorethylene.

While hesitating to draw conclusions from a single case, the authors suggest the wisdom of withholding anthelmintics from those suffering from hookworm who have obvious signs of malnutrition, as is done when patients suffering from hookworm disease with severe anaemia are first treated for the latter condition.

[While the author's advice is timely, it would be difficult to point to the exact ultimate cause, or causes, of death in this case : the patient was already in a very bad condition, and several forms of medication were necessary : although it seems evident that the tetrachlorethylene was an accentuating cause, it would not be proper, as the authors rightly point out, to discredit it on this count, in view of its generally recognized low toxicity.]

*H. J. O'D. Burke-Gaffney.*

HITCH, J. M. **Systemic Treatment of Creeping Eruption.** *Arch. Dermat. & Syph.* 1947, May, v. 55, No. 5, 664–73. [13 refs.]

For larva migrans no satisfactory treatment, either local or systemic, has yet been devised. Approximately 40 cases of this condition were seen at a naval hospital in North Carolina between July and December 1945. Of these, 33 were given treatment and were followed for a sufficient time to make their cases worth recording.

The diagnosis was made on clinical grounds, supported by the circumstantial evidence of a local canine and feline population with heavy *Ancylostoma braziliense* infection, a sandy soil, and a high rainfall.

The patients were mostly children between the ages of 1 and 7 years, but there were 9 young adults in the series. Age seemed to make no difference to the response to treatment. "The number of active larvae [presumably lesions] ranged from one to considerably more than a hundred on a single patient." An eosinophilia was the general finding, but there was little correlation between the degree of the eosinophilia and the extent of the lesions. The sedimentation rate was slightly raised, but there was no evidence of anaemia.

In no case was an intestinal infection of *A. braziliense* demonstrated, and X-rays showed no lung lesions in any case.

The drugs used were fouadin, neostibosan, potassium antimony tartrate and oxophenarsine hydrochloride. In many cases, more than one drug was given at different times.

With fouadin, 17 patients were treated with doses from 5·0 ml. in adults to 1·0 ml. in young children. Five were classed as cured after 15, 8, 4, 4 and 2 injections. Amongst the failures, four had 10 or more injections.

With neostibosan, 10 were treated with doses of 0·15 to 0·2 gm. for adults and 0·05 gm. for young children. Of these, 3 were classed as cured after 2, 2 and 1 injections. None of the failures had more than 1·75 gm. of the drug.

Only 2 patients were treated with potassium antimony tartrate : one received the negligible amount of 0·01 gm., after which a change was made to fouadin, and the other received 0·75 gm. The latter was classed as cured, but this patient had previously had both fouadin and neostibosan.

Oxophenarsine hydrochloride was given to 17 patients, intravenously every 3 to 5 days, in doses of 0·06 gm. for adults and proportionately for children. Of these 17 patients, 8 were cured and the fate of four was unknown. The cured patients received an average of 4 injections each, from 1 to 9, and the 5 failures from 2 to 9, average 5 injections.

It is concluded that the "evidence at hand indicates that oxophenarsine hydrochloride is probably superior to the others employed for this disease."

It was pointed out that clinical considerations had precedence in this investigation so that appraisal of the value of these drugs is difficult. There is nowhere any positive correlation between the amount of drug given and the therapeutic effect. The immediate clinical response was usually a cessation of pruritus, which suggests that all these drugs have a "larvistatic" action: this was somewhat commoner with oxophenarsine hydrochloride. It was thought possible that larger doses might have produced more definite results.

[On the data presented, there is no real evidence that any drug had any permanent effect. The dosage of the antimony drugs was, except in one or two cases, very far below the level at which one could expect any anthelmintic effect, if one is to judge by recent work on filariasis and schistosomiasis.]

*L. E. Napier.*

FLOCH, H. & DE LAJUDIE, P. Sur la filariose à *W. bancrofti* en Guyane française. La lymphangite endémique et l'éléphantiasis des pays chauds. [**Infection by *Wuchereria bancrofti* in French Guiana.**] *Bull. Soc. Path. Exot.* 1947, v. 40, Nos. 1/2, 49–63. [23 refs.]

From 1939 onwards, these authors have conducted an enquiry into the prevalence of *W. bancrofti* in French Guiana. The blood specimens were taken at 3 p.m. in the day and between 9 and 10 at night in 683 individuals.

The measurements of 70 microfilariae in thin blood-films were rather smaller than those usually given by authorities, but the authors failed entirely to find the embryos either of *Mansonella ozzardi* or of *A. perstans*. Of the total, 253 were not Creoles and except for one European who was infected with *W. bancrofti* they were not studied further. Of the 430 Creoles, 165 were soldiers, 54 patients in the general hospital, 137 in the St. Denis hospital, 66 children, and 8 employees of the Pasteur Institute. 320 were males and 110 females.

All the women were indigenous and had resided in Guiana for 20 years. Among the men, there were 70 from Martinique, and 33 from Guadeloupe, who had emigrated to Guiana in March, 1945, but who had been originally infected in their countries of origin. The results for the three different groups are shown in the following table :—

Men

| From Guiana | | From Martinique | | From Guadeloupe | |
|---|---|---|---|---|---|
| Number | Positive | Number | Positive | Number | Positive |
| 217 | 27 | 70 | 8 | 33 | 4 |
| = 12·4 per cent. | | = 11·4 per cent. | | = 12·1 per cent. | |

Women

| Total | | From Guiana | | Total | |
|---|---|---|---|---|---|
| Number | Positive | Number | Positive | Number | Positive |
| 320 | 39 | 110 | 20 | 430 | 59 |
| = 12·1 per cent. | | = 18·1 per cent. | | = 13·7 per cent. | |

On the whole, the number infected tended to increase progressively from 8·2 per cent. in the age group 6–20, to 15·3 per cent. at 50 years onwards. The youngest was a boy of 12 : the oldest a woman of 80.

The remainder of this paper concerns itself with the now familiar arguments on the pathology of *W. bancrofti*, especially with reference to its rôle in the production of lymphangitis and elephantiasis. *P. Manson-Bahr.*

FLOCH, H. & DE LAJUDIE, P. Trypanosomiase et filarioses humaines d'importation en Guyane française. Taux d'infestation par *A. perstans* chez des tirailleurs sénégalais. [**Trypanosomiasis and Filariasis imported into French Guiana : Infection Rate of *A. perstans* in Senegalese Troops.**] *Bull. Soc. Path. Exot.* 1947, v. 40, Nos. 1/2, 17–22. [Refs. in footnotes.]

The authors' report on filariasis found in a unit of soldiers during surveys of blood films made because a case of trypanosomiasis [*T. gambiense*) was found in a soldier of the " Antilles Battalion " in French Guiana ; this man had originally been recruited in French Guiana on the borders of the Ivory Coast where

he was born. A systematic search of 613 Senegalese troops disclosed microfilariae of *Acanthocheilonema perstans* in 41 (6·6 per cent.), but no other cases of trypanosomiasis were found.

In another series of 111 men, the authors examined blood specimens taken at 3 p.m. in the day and at 9 to 10 p.m. at night. Among 111 troops, 14 or 12·6 per cent. were parasitized with *A. perstans*, but the diurnal blood specimens were more frequently positive than the nocturnal (12 and 7 respectively). No embryos of *Wuchereria bancrofti* were encountered. The figures obtained are considerably lower than those usually given for other parts of Central Africa. Microfilariae of *A. perstans* were also demonstrated in one European who had been resident six years in French Guiana. The original infection had been contracted in 1936–1938 during a previous residence in the Chad district of Africa. The life-span of *Loa loa* in a European who became infected in Gabon in 1932 is given as 8 years. *P. Manson-Bahr.*

WARREN, Virginia G. **Studies on Filariasis. V. Serological Relationships between Antigenic Extracts of Four Nematodes.** *Amer. J. Hyg.* 1947, May, v. 45, No. 3, 299–301.

Warren *et al.* [this *Bulletin*, 1946, v. 43, 1056] found that two complement fixing antigenic components were present in each of two filarial worms, *Wuchereria bancrofti* and *Dirofilaria immitis*. One of these was group-specific and the other species-specific. Recently, the senior author extended these studies to include *Litomosoides carinii* and *Trichinella spiralis*, and the results of this work are here recorded. The *L. carinii* antigen used was made from adult worms, the *T. spiralis* antigen from dried larvae, extracted by peptic digestion from rat muscle. Stock suspensions of both were made up to a dilution of 1 : 100 in physiological saline with 0·3 per cent. phenol. Similar extracts were made of *W. bancrofti* and *D. immitis*. Common antigenic components were sought by cross complement fixation tests done with hyperimmune rabbit sera. These sera were obtained by prolonged immunization with suspensions of microfilariae of *W. bancrofti*, larvae of *T. spiralis* and adult *D. immitis*. For a month, rabbits were given ten injections totalling 2·5 ml. of washed worm-sediment packed by centrifugation, and 5·0 ml. of 1 : 100 antigen. The rabbits were bled 12 days after the last inoculation. Because only a small quantity of *L. carinii* was available, no anti-Litomosoides serum could be made.

The four antigens were used at dilutions of 1 : 200, 1 : 400 and 1 : 800 and were tested against the three antisersa, the latter being diluted from 1 : 4 to 1 : 256. The antigens reacted, not only with their own antisera, but, as was expected, with the others as well. *T. spiralis* antigen reacted as well with the *D. immitis* antigen as with its own serum, but the *W. bancrofti* and *D. immitis* antigens reacted with their homologous sera at higher titres. A table shows the titres obtained when *W. bancrofti*, *D. immitis* and *T. spiralis* immune sera were allowed to react with the four antigens diluted 1 : 200, and indicates that the *D. immitis* immune serum appears to be the least specific, because it reacted to nearly as high a titre with the three heterologous antigens as with its own antigen, while the other immune sera did not.

It appears, therefore, that the complement-fixing group-specific factor common to *D. immitis* and *W. bancrofti* is also present in *L. carinii* of the cotton rat, and in *T. spiralis*, which is not a Filarioid nematode, as are the other species used.

The author briefly records earlier work, most of which has been abstracted in this *Bulletin*, which demonstrated the existence of antigens common to *Onchocerca volvulus* and *Loa loa*; to *L. carinii* and *W. bancrofti*, *O. volvulus* and *L. loa*; and to *D. immitis* and other filarioid nematodes capable of infecting man. *G. Lapage.*

CULBERTSON, J. T., ROSE, H. M., HERNÁNDEZ MORALES, F., OLIVER GONZÁLEZ, J. & PRATT, Caroline K. **The Experimental Chemotherapy of Filariasis Bancrofti.** *Puerto Rico J. Pub. Health & Trop. Med.* 1946, Dec., v. 22, No. 2, 139–73, 2 pls. [Spanish version 174–209.]

This is a very comprehensive account of the experimental work designed to find a drug suitable for the treatment of filariasis in man. Much of this work has already been reported [this *Bulletin*, 1944, v. 41, 772; 1945, v. 42, 136; 1946, v. 43, 54, 354].

The preliminary tests were carried out with the naturally-occurring filariasis (*Litomosoides carinii*) of cotton rats. The most promising results were obtained with neostibosan and neostam. It was shown that these two drugs had little immediate effect on the circulating microfilariae, but quickly killed the adult worms. It was assumed that the same thing would occur with human filariasis, and therefore less significance was given to the immediate effect on the microfilaria counts, but the cases were followed for much longer periods than hitherto. Neostibosan was first chosen on account of its low toxicity. In the first series the drug was given in the ordinary clinical doses, but in subsequent series a more intensive course, up to 15·5 gm. in 15 days, was given. In 23 of 35 patients treated, microfilariae disappeared completely and failed to return during a long period of observation (20 months in most cases); in 7 there was a very marked reduction and complete cures seemed likely; and, in the remainder, there was a marked reduction in microfilariae in the blood.

The other drugs used were neostam (11 cases), urea stibamine (6), stibanose (5), fouadin (15), anthiomaline (20), tartar emetic (4), and melarsen oxide (18 cases). With each of these drugs, a reduction in microfilariae was effected in the majority of cases, and with all but fouadin at least one case showed the complete disappearance of microfilariae.

Fifteen control cases were followed for 20 months. In none did the microfilariae disappear; in three there was a slight reduction, and in 12 there was an increase in the microfilariae counts.

[This paper provides the most complete account of this important work that is at present available.] *L. E. Napier.*

GABATHULER, Maria J. & GABATHULER, Alois W. **Report of Onchocerciasis in the Ulanga District (Eastern Province, T. T.).** *East African Med. J.* 1947, May, v. 24, No. 5, 188–95.

A focus of onchocerciasis is described in the Ulanga District of the Eastern Province of Tanganyika, where the infection rate is 39 per cent., a figure obtained by examining 1,763 hospital out-patients. The diagnosis was based upon the presence of subcutaneous nodules, some of which were excised and were found to contain adult worms and microfilariae. There was a rising incidence of the disease according to age, varying from 11 per cent. below 15 years to 75 per cent. in people over 45.

Dryness of skin and itching were noted in many of the cases and deep abscesses occurred. No definite ocular lesions were observed.

In this locality, the altitude range is between 900 feet and 3,000 feet. Immature stages of Simuliidae were found in all the streams, which are not usually fringed by forest.

[The diagnosis of onchocerciasis was apparently only established in a minority of the patients and it is doubtful how many of the remainder were really cases of the disease. The authors do not appear to have been familiar with the "skin-snipping" technique, the use of which greatly facilitates diagnosis.

*Simulium damnosum* is suggested as the local vector, but no identifications were made and *S. neavei* may well have been, in this locality, the carrier species.]

*P. C. C. Garnham.*

LINDBERG, K. Enquête épidémiologique sur la dracunculose dans un village de Deccan (Inde). [**Epidemiology of Dracontiasis in the Deccan.**] *Bull. Soc. Path. Exot.* 1946, v. 39, Nos. 7/8, 303–18.

As it was found that many cases of dracontiasis attending an ambulance train came from the village of Bhosra in the Deccan (India), it was decided that an epidemiological survey should be carried out in this village. The inhabitants were divided into three groups—(*a*) those who drank water from eight curb wells, (*b*) those who drank from the two step wells, and (*c*) those who lived outside the village. For estimating the population at risk, two years was taken as the incubation period. In group (*a*), 78 of 379 (20·6 per cent.) males and 34 of 393 (8·7 per cent.) females, or 14·5 per cent. of the total population at risk, were affected; in group (*b*), 112 of 223 (50·2 per cent.) males, 50 of 202 females (24·1 per cent.), or 38 per cent. of the total population at risk, were affected; and in group (*c*), 61 of 230 (26·5 per cent.) males, 26 of 216 (12 per cent.) females, or 19·5 per cent. of the total population at risk, were affected.

Of 237 children under the age of 4, only one was affected. Three of 49 children aged 4 were affected, but after this the percentage incidence rises sharply and during the next five-year period 72 out of 247 (29 per cent.) children were affected. In the next five quinquennial periods, the incidence rises to 57·9 per cent.; 68·5 per cent; 76·8 per cent; 79·1 per cent.; and 85·6 per cent.; but after the age of 35, the incidence begins to fall and in the 7th decade only 5 of 64 persons were affected.

The number of worms in each individual varied from 1 to 50. The numbers of persons with 1, 2, 3, 4, 5 and 6 worms, were, respectively, 163, 73, 34, 20, 13 and 8. Only 26 persons had seven or more worms, of whom 3 had 23, 25 and 50 worms, respectively.

The number of worms that each individual had in one year was, however, on a smaller scale: only 19 suffered from four or more worms and the figures for one, two and three worms were 220, 76 and 20, respectively. One person had 15 worms in a year.

The number of years that each individual suffered from dracontiasis varied up to 55 years (in one instance). Few (24) gave a history of more than four years' duration: the figures for 1, 2, 3 and 4 years were, respectively, 216, 62, 28 and 10 persons.

The exact point of the appearance of the head of the worm was noted in 758 instances. The detailed enumerations given can be summarized as follows:—

Foot 112; ankle 248; leg 245; knee 60; thigh 50; hip 11; hand (dorsal) 5; wrist 5; forearm 6; elbow 2; shoulder 1; chest 4; abdomen 2; scrotum 6.

The principal intermediate host of *Dracunculus medinensis* in this region is *Thermocyclops vermifer* Lindberg. Other copepods found in the village wells were *Eucyclops serrulatus* (Fischer), *Mesocyclops leuckarti* Claus, *Thermocyclops hyalinus* (Rehberg) and *Tropocyclops multicolor* Lindberg. *L. E. Napier.*

LINDBERG, K. Dracunculose dans l'état de Djodhpour (Radjpoutana), Inde. [**Dracontiasis in Jodhpur.**] *Bull. Soc. Path. Exot.* 1946, v. 39, Nos. 7/8, 318–28.

The State of Jodhpur in Rajputana (India) is one of the most heavily infected foci of dracontiasis in Asia. The numbers of cases treated in the state hospitals

during the years 1937 to 1941 were 258, 657, 1027, 958 and 1297, respectively. The two most heavily infected localities were Nagaur and Didvana, which during 1941 showed respectively 256 and 378 cases, representing 1·20 per cent. and 2·81 per cent. of the total hospital attendances. The inhabitants depend almost entirely, for drinking water, on rain water collected in natural depressions, since the well water is often very saline.

The commonest Cyclopidae identified were *Mesocyclops leuckarti* Claus, and *Thermocyclops hyalinus* (Rehberg). Others found included *Microcyclops varicans* Sars, and *M. linjanticus* (Keifer). In Didvana, in a specimen of *Mesocyclops leuckarti* collected at the beginning of April from an open reservoir (*tank*), a larva of *Dracunculus medinensis* was found.

From the records of hospital attendance, it appears that the months when the largest number of onsets occurs are May to September, with July as the peak month : in the two towns, 90 per cent. and 85 per cent. of cases occurred in these months.

The question of the factors that determine the seasonal incidence of dracontiasis was discussed and it was concluded that a high temperature was the important factor. A certain height of temperature is necessary for the development of the larvae in the intermediate host. *L. E. Napier.*

BURROWS, R. B., MOREHOUSE, W. G. & FREED, J. E. **Treatment of Trichuriasis with 'Enseals' of Emetine Hydrochloride.** *Amer. J. Trop. Med.* 1947, May, v. 27, No. 3, 327–38. [12 refs.]

*Trichuris* infection is not uncommon in some of the Southern United States, and is often a problem in mental institutions. No drug hitherto used has proved very satisfactory in the treatment of this infection. *Léche de higueron* is only effective in the fresh state, and its active principle, ficin, has proteolytic properties which make its use undesirable except in small doses.

It was observed that 'enteric sealed' tablets of emetine hydrochloride had some effect on this worm [this *Bulletin*, 1946, v. 43, 928]. This investigation was undertaken to confirm and extend this observation. Twenty-three patients with multiple infections, including *Trichuris trichiura*, were selected from the inmates of a mental hospital. They were all classed as having dirty habits, ranging from a disinclination to wash (100 per cent.) to coprophagy (8·7 per cent.). These patients had a total of 150 parasitic infections with 12 different species of metazoan or protozoan parasites, an average of 6·52 species per patient.

A very thorough pre-treatment examination included 3 to 6 stool examinations. Egg and larva counts were also made. Efforts were made to prevent the patients acquiring fresh infections during the course of treatment; nevertheless, there was evidence that some did acquire fresh infections. Repeated egg counts were made during the investigation, the stools were screened for dead worms, and in the majority of cases the complete examination was repeated six weeks after treatment was complete. Six different dosages were adopted :—

| | | | | | |
|---|---|---|---|---|---|
| 1 grain | daily | for 12 days | — | 5 | patients. |
| 2 grains | ,, | ,, 6 ,, | — | 5 | ,, |
| 3 ,, | ,, | ,, 4 ,, | — | 5 | ,, |
| 3 ,, | ,, | ,, 2 ,, | — | 4 | ,, |
| 3 ,, | ,, | in 1 day | — | 3 | ,, |
| $5\frac{1}{3}$ grains | in 24 hours | | — | 1 | patient. |

The tablets (enseals containing $\frac{1}{3}$ of a grain each) were given after meals in 15 instances, before in 8 : no difference in effect was noted.

The drug had a pronounced laxative effect and within 24 to 30 hours, those receiving the larger doses passed mucus, fragments of mucosa and blood. The adult worms were frequently embedded in the detached mucosa. No lasting ill-effects followed and the denuded areas apparently healed without secondary infection. Nausea and vomiting occurred in a few patients.

All six regimens had the effect of removing the majority or all the worms from the lower bowel. The best results were obtained with 2 grains daily, mainly because in the 3-grain group there was a woman who chewed her tablets so that their effect was partially neutralized (she did not vomit). In the 2-grain group, 3 patients had negative stools for 3 weeks, one for ten days, and one had markedly reduced egg counts. In all patients the eggs tended to reappear after 30 days, but in much reduced numbers. The shorter courses, 3 grains for two or one day, were less effective, in only one case was the egg count *nil*, but in all there was a marked reduction.

In one case (3 grains for 4 days) 2,538 worms were recovered from the stools. In most cases, the worms appeared in the stools within 30 hours, and in all by the 48th hour after the starting of treatment. By the 132nd hour all but one, a very constipated woman, had ceased to pass worms.

There was a distinct effect on the hookworm infections; from the stools of 7 of the 21 infected patients, hookworm ova disappeared for some time, 10 to 28 days, and in all others but two there was a persistent reduction in the egg counts. However, few adult worms were recovered. There was some reduction in the *Ascaris* and *Enterobius* infections but apparently none in the *Strongyloides*.

The flagellate infections were not affected by the treatment, but in 4 out of 5 cases of the first three groups in which *Entamoeba histolytica* cysts had been found, they remained absent from the stools for six weeks.

In 9 of the 15 patients of the first three groups there was a distinct increase in weight, from 2 to 13½ pounds, by the end of six weeks. Twelve showed a reduction in the eosinophil count, averaging 5 per cent., while three showed an increase; the latter had other helminthic infections persisting. No other significant changes in the blood examinations were noted.

It is concluded that emetine by mouth in enteric-sealed tablets is the treatment of choice in *Trichuris* infection. *L. E. Napier.*

GELLER, E. R. [**Analysis of the Population of *Enterobius vermicularis* in various Portions of the Host's Intestine, and Autoinvasion in Enterobiasis.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1946, v. 15, No. 5, 45–52. [14 refs.] [In Russian.]

The author records observations carried out with the view to determine the question whether threadworms were capable of multiplying within the alimentary tract of the host without being discharged; in other words, whether autoinfection of the same host was possible. With this object in view, the author examined the state of development of eggs in threadworms obtained from rabbits and human beings under the following conditions: (*a*) worms which had actively crawled out of the rectum and were found in the perianal region; (*b*) those which were found in the stools; (*c*) those which were discharged by enemata; and (*d*) worms removed by dissection of the intestine. The results of this investigation are summarized as follows:—(1) Gravid threadworms which actively crawl out of the rectum contain eggs which are capable of developing outside the host's body, *i.e.* they are in the gastrula stage in the case of *Passalurus ambiguus* and in the larval stage in the case of *Enterobius vermicularis*; (2) worms which are discharged passively with the faeces contain eggs which are incapable of developing in the external environment; (3) worms expelled with the help of deep enemata contain unsegmented eggs or those which

are in the early stages of segmentation; (4) from dissections it is evident that the majority of mature males and females are found in the upper region of the large bowel, where the females are fertilized and remain during the early stages of development of the ova in their gonads; (5) segmentation of the ova takes place in the lower regions of the large bowel, whereas the stages capable of continuing their development outside the body are produced in the perianal part of the rectum; (6) from these data it is evident that autoinvasion does not occur in *Enterobius* infection. *C. A. Hoare.*

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## DEFICIENCY DISEASES.

WALTERS, J. H. **Dietetic Deficiency Syndromes in Indian Soldiers.** *Lancet.* 1947, June 21, 861–5, 2 figs.

Members of an Indian infantry battalion, on active service, developed a syndrome characterized by severe wasting, chronic steatorrhoea and macrocytic anaemia accompanied by evidence of specific deficiencies of the vitamin B complex. Three-quarters of the force were Jats and one-quarter Rajputana Mussulmans. The former are habitual vegetarians and the latter meat-eaters, though they tend to be smaller and more slenderly built. The Mussulmans ate a 6-oz. meat ration twice or three times a week, but in other respects the diets were identical.

The battalion was engaged in the relief of Kohima, and from May 17th to August 23rd, 1944, remained in this area, encircled by swarms of flies and insanitary conditions; consequently most of the men developed diarrhoea or dysentery. When the battalion was withdrawn to India on September 1st, 1944, 126 men out of a total strength of 815 were admitted to hospital with nutritional deficiency.

In this paper, 42 of the worst cases are described. Of these only three were Mussulmans, the remainder Jats (vegetarian). The illness had commenced two months before withdrawal from the fighting area. The initial symptom was loss of appetite, followed by distension after food, then diarrhoea with large, pultaceous, frothy stools. The tongue then became sore. Wasting and extreme weakness rapidly developed. The symptoms appear to have been precipitated by diarrhoea in 6 cases, bacillary dysentery in 16, amoebic dysentery in 5, and malaria in 10.

The following syndromes were encountered:—

(1) Gross alimentary dysfunction with steatorrhoea. (2) Macrocytic anaemia. (3) Alimentary dysfunction combined with macrocytic anaemia.

The tongue changes were of two distinct types:—A smooth, glazed, mauve surface and a bright, magenta, inflamed surface associated with aphthous ulcers. Lip lesions, perlèche and cheilosis were present and the swollen tongue was indented by the teeth. This condition responded to a course of riboflavin, 9 mgm. daily, orally for four days.

Dysphagia of the Plummer-Vinson type was met initially in one case.

Gastric analysis in 29 cases showed achlorhydria in 17 per cent. and initial hypochlorhydria in 26 per cent. Abnormally high faecal fats (over 25 per cent. by dried weight were found in 28 out of 41 cases. The highest figure was 71 per cent. (split 63 per cent.). In 9, there was still moderate steatorrhoea (up to 44 per cent.) on discharge. Diarrhoea was found initially in 7 cases (17 per cent.); relapses with indefinite exudate occurred in course of treatment in 17

(40 per cent.). This cleared quickly with sulphaguanidine. Sigmoidoscopy in 6 out of 14 cases showed the mucosa much attenuated and dry, sometimes with a strikingly granular surface.

Considerable wasting occurred in 33 cases (78 per cent.), but disappeared with treatment. Macrocytic anaemia was found in 37 cases (90 per cent.), the highest mean corpuscular volume being 161 c$\mu$. A microcytic anaemia was found in one case. Normocytic orthochromic anaemia was found in 3 cases. Total serum proteins were about 7 gm. per 100 cc. with a low albumin/globulin ratio.

Two changes were seen in the skin, a "crazy pavement eruption" and follicular hyperkeratosis. Peripheral neuritis of a mild degree was present in 64 per cent. and transient acute psychosis developed in 2. Night blindness was seen in 1 and xerophthalmia in another severe case.

Treatment consisted in a high caloric dietary with milk as the main source of protein, liver soup and intensive vitamin therapy with nicotinic acid, riboflavin and liver extracts. Sulphaguanidine was used for those who developed diarrhoea with cellular exudate. Ferrous sulphate, 32 grains daily, was used for hypochromia prior to parenteral liver treatment. Blood transfusion was given in all cases with a red cell count below 2,000,000, and plasma transfusions to five patients with oedema. Two patients died, one of peripheral circulatory failure during a relapse of subtertian malaria, the other of acute pulmonary oedema following a transfusion. Three patients were invalided out of the army and the remaining 37 were eventually discharged, 11 with red-cell counts between 3,200,000 and 4,000,000 per cmm.; 9 had some residual steatorrhoea.

It is pointed out that there were 13 times as many cases of grave malnutrition and anaemia among the vegetarian Jats as among the meat-eating Mussulmans. Bowel infections were important precipitating factors. Hyporiboflavinosis during the recovery phase (which might relapse) is noted as of interest, and conforms to a similar occurrence among civilian internees in Germany after starvation.

It is observed that the syndrome shown by these patients was that of sprue, although the incidence of grave macrocytic anaemia was higher than that in British troops. The active service diet was noted to be adequate, but there was evidence that it was not all consumed; and further, alimentary infection, by reducing and interfering with absorption, might have precipitated the state of deficiency. The atrophic changes in the tongue did not respond to riboflavin, but to large amounts of nicotinic acid given by the parenteral route.

*P. Manson-Bahr.*

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## SPRUE.

HOWELL, C. A. H. **An Early Sign in Sprue. The Split : Unsplit Fat Ratio in the Faeces.** *Lancet.* 1947, July 12, 55.

In 1944, 36 cases of sprue syndrome were studied in Karachi: thirty of them were early cases and over half of these had developed within three months of arrival in India. The author found that, whilst the total faecal fat was often within normal limits, in the early stages a significant rise in the split : unsplit fat ratio could be found, especially in those who were put on a fat-free diet.

In 11 patients having a full fat diet (110 gm. daily) there were four whose total faecal fat was below 35 per cent.: in only one was the split : unsplit fat ratio also within normal limits.

In 18 others, having a low-fat diet (16 gm. daily) there were 10 with total faecal fats below their normal (20 per cent.), and of these only two had a normal

ratio ; in the eight whose total faecal fat was above 20 per cent. the ratio was greatly increased in every case. Hence, in the 14 doubtful cases, the ratio was increased in 11.

In mild cases, response followed 150 mgm. of nicotinic acid daily and a low-fat diet of 16 gm. : liver therapy was added in chronic cases.

During recovery, the fats ratio lagged behind the total faecal fat in returning to normal, by one or two months : in two relapsed cases the raised split : unsplit fat ratio actually increased further.

The author considers that this rise in the split : unsplit fat ratio in the early stages, and the lag in its return to normal, are helpful signs in early or doubtful cases of sprue and in its prognosis : he does not, of course, suggest that this is an infallible test for sprue. *H. J. O'D. Burke-Gaffney.*

ROBSON, J. S. **Plasma and Corpuscular Cholesterol in Sprue.** *Brit. J. Exper. Path.* 1947, Apr., v. 28, No. 2, 152–60. [29 refs.]

The fasting values of plasma and corpuscular cholesterol and cholesterol ester of 5 normal persons and of 5 patients suffering from sprue were compared. Samples of blood were obtained after an overnight fast and each subject then received a meal containing 18 gm. of milk fat in 300 cc. Subsequent samples of blood were examined.

In the sprue patients there was a fall, but in the controls a rise in total plasma cholesterol following the fat meal. Both groups showed an increase in the total plasma cholesterol ester. Free plasma cholesterol fell in the sprue cases and rose in the controls. Total corpuscular cholesterol showed inconstant changes. No cholesterol ester was detected in the corpuscles of normal subjects or fasting patients. The average increase in corpuscular ester during fat absorption was 16 mgm. per ml., but only one case of sprue showed any increase. The fasting ratio of ester/free cholesterol was similar in both groups and did not change during fat absorption in the controls, but in the sprue cases there was a marked increase in the ratio.

The results are discussed in relation to the suggested function of bile cholesterol as a mediator in fat transport in the gut, and the known deficiency of fat absorption in patients suffering from sprue. *J. H. Birkinshaw.*

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## VENOMS AND ANTIVENENES.

EICHBAUM, F. W. Hemaglutininas nos venenos de serpentes sulamericanas. [**Haemagglutinins in the Venom of South-American Snakes.**] *Mem. Inst. Butantan.* 1946, v. 19, 229–40. [10 refs.] English summary.

EPHRATI, P. **Snakebite Treatment. (Preliminary Report).** *Harefuah.* Jerusalem. 1947, July 1, v. 33, No. 1. [In Hebrew 2–3. English summary 3.]

The author found that the time-honoured first aid treatment for snake-bite appeared to make no difference to its further course. In his experience, viper venom is probably absorbed through the lymphatics and treatment should be directed towards immobilizing the affected limb by splinting : cold compresses also appear to prevent absorption of the venom. Immediate transport of the patient to hospital and provision of blood donor are important factors.

Hospital treatment should aim at preventing insufficiency of the peripheral circulation, by the intravenous use of normal saline and blood drop by drop. Severe anaemia may occur on the 3rd or 4th day : in such cases, a further blood transfusion may be needed.

The author has found this treatment encouraging in its result and simple in its practice. [Nevertheless, immobilization will not be practicable where the bite is situated other than on a limb : it is hardly to be recommended that general first-aid measures should be abandoned altogether, especially those directed to treating shock and maintaining the patient's general condition.] See also this *Bulletin*, 1939, v. 36, 863, and 1946, v. 43, 478, for the use of soap injections in delaying the onset of symptoms. *H. J. O'D. Burke-Gaffney.*

BLANC, G. & DELAGE, B. Contribution à l'étude du venin de *Scorpio* (*Heterometrus*) *Maurus* Lin. Test de toxicité par voie nerveuse. [**The Venom of** *Scorpio* (*Heterometrus*) *maurus*. **Toxicity when introduced by the Nervous Route.**] *C. R. Soc. Biol.* 1947, Apr., v. 141, Nos. 7/8, 322–4.

The sparrow is comparatively susceptible to the venom of *H. maurus* ; inoculation of one telson or even less proving fatal. Rabbits, on the contrary, resist even large doses, though they may become cachectic and die later ; they are not immunized by these doses. *H. maurus* toxin is much less potent than those of other North African scorpions ; 5–6 mgm, being needed to kill white mice as compared with ½–1/40 telson of *Buthus* or *Prionurus*. Compared with snake venoms, 250–300 mgm. of *H. maurus* venom is needed to kill a mouse whereas 0·2–0·25 mgm. of Colubridae or Viperidae venom will kill a man. To test *H. maurus* venom by subcutaneous inoculation, therefore, necessitates the use of a large number of scorpions, so the authors made trial of inoculation directly into the central nervous system, transorbital or transcranial, which produces paraplegia, forced movements, retraction of the head, stiffening of limbs and death.

A standardized emulsion in saline is obtained by grinding up 56 telsons in 15 cc. saline, so that each cc. or " scorpion unit " contains the toxin of 3·7 scorpions. Intravenous inoculation of as much as 5 cc. (18 scorpions) has no effect on a rabbit, but by the transorbital route the venom of 0·5 telson upwards caused death in 1–2 hours, and 0·3 in about 16 hours ; 0·2 did not kill but caused nervous symptoms. The degree of immunity, if any, conferred by this method of inoculation is to be the subject of a future study.

*H. Harold Scott.*

BUECHERL, W. Ação do veneno dos escolopendromorfos do Brasil sôbre alguns animais de laboratório. [**Action of Brazilian** *Scolopendromorpha* **Venom on Laboratory Animals.**] *Mem. Inst. Butantan.* 1946, v. 19, 181–97, 10 figs. English summary.

The author studied the venom of the five Brazilian species of *Scolopendromorpha* in mice, guineapigs and pigeons. He found that the principal effects were great pain, redness and some superficial necrosis, which absorbed within 1 to 3 weeks without leaving a scar.

As a result of these experiments, the author is satisfied that the venom of the two common Brazilian centipedes *Scolopendra viridicornis* and *S. subspinipes*, when injected by an occasional bite, is too feeble to cause any serious toxicity or danger to life in human beings, whether adults or children.

*H. J. O'D. Burke-Gaffney.*

## DERMATOLOGY AND FUNGUS DISEASES.

BONNE, C. Over blastomycosen in het bijzonder die van Indonesië. [**Blastomycoses in Indonesia.**] *Med. Maandblad.* Batavia. 1947, May, No. 10, 186–94.

The term " mould " is one of very diverse significance, and moulds are very polymorphic organisms. In medicine, mould diseases are classified largely by their differential morphology, the appearance of the parasites in the tissues and the reactions which they induce. Blastomycoses are a typical example of this last classification. It appears that the Blastomyces is, for the most part, not a yeast cell proper but a developmental form of very different mould species, and the reaction produced is of the nature of a specific granuloma. In this review, the author adopts the classification (Brumpt) of the human parasitic moulds into : (1) *Hyphomycetes* (Fungi imperfecti) whose filaments form simply through detachment, or through developing spores, or form conidia ; (2) *Ascomycetes* in which the spore formation develops in definite organs, or *asci* ; and (3) *Phycomycetes* with a non-septate mycelium capable of sexual reproduction by fertilization of ova. The separate disease conditions and their causal parasites under these headings are :—*A. HYPHOMYCETES* : (1) *Cryptococcus hominis*, the cause of Busse-Buschke blastomycosis. (2) *Torulopsis histo'ytica*, of torulosis of brain and meninges ; (3) *Phialophora verrucosa*, of chromoblastomycosis ; (4) *Trichosporium pedrosi*, of chromoblastomycosis ; (5) *Histoplasma capsulatum*, of histoplasmosis ; (6) *Histoplasma farcinimosum*, of lymphangitis epizootica. B. *ASCOMYCETES* : (7) *Endomyces dermatitidis*, of Gilchrist blastomycosis ; (8) *Saccharomyses tumefaciens*, of so-called yeast cell parasitism. C. *PHYCOMYCETES* : (9) *Coccidioides immitis*, of coccidioidal blastomycosis affecting lungs, meninges, skin and bones ; (10) *Paracoccidioides brasiliensis*, of coccidioidal blastomycosis affecting lymph nodes, intestine and skin ; (11) *Rhinosporidium seeberi*, of rhinosporidiosis. There follow *seriatim* descriptions of the histological appearances of each of these lesions and of the symptomatology. Examples of many of them, though not all, have been recorded in Indonesia. *W. F. Harvey.*

CALERO, M. C. **Madura Foot (Mycetoma). First Report from the Isthmus of Panama.** *Arch. Dermat. & Syph.* 1947, June, v. 55, No. 6, 761–71, 6 figs. [Refs. in footnotes.]

SALAZAR LEITE, A. & BASTOS DA LUZ, J. Contribuição para o estudo das esporotricoses na provincia ultramarina de Moçambique. [**Sporotrichoses in Mozambique.**] *An. Inst. Med. Trop.* Lisbon. 1946, Dec., v. 3, 187–94, 10 figs. on 5 pls. [Summary in English by the author.]

" Attention is called to the existence of sporotrichosis in Mozambique. After a short clinical description of a case in a negress observed at Lourenço Marques (Miguel Bombarda Hospital), the respective mycological study is made as well as a detailed histopathological examination. In this were found, beside the typical lesions of the sporothrichosis, aspects of fibro-angiomatosis type that according to the knowledge of the authors, have not yet been described in that mycosis. Such a curious fact is registered which in no way invalidates the clinical diagnosis at first made and later confirmed by the cultural examination."

FEREBEE, S. H. & FURCOLOW, M. L. **Histoplasmin Sensitivity among Siblings.** *Pub. Health Rep.* Wash. 1947, June 6, v. 62, No. 23, 834–47, 5 figs.

This paper, which should be read in the original, is a statistical study of the familial incidence of sensitivity to histoplasmin amongst white children between

the ages of 1 and 19 years, resident in Kansas City Mo. and its environment, based on figures from the investigation on more than 16,000 children undertaken by FURCOLOW, HIGH and ALLEN [see *Bulletin of Hygiene*, 1947, v. 22, 36]. The association of "histoplasmin sensitivity" with individual family groups could be taken to suggest the operation of genetic, broad environmental (social, economic, geographic, etc.) or specific environmental factors localized in the home (common food supply, household pets etc.)

The inclusion of many family groups of 2 to 7 members provided the opportunity to study the incidence of the histoplasmin reaction amongst siblings, but, in view of the proved importance of the geographical factor, the study was restricted to siblings who had always lived in Kansas City or its neighbourhood.

The results of the analysis, in general, showed that there was a similarity in the sensitivity to histoplasmin between children of the same family and the proportion of reactors was higher in those family groups in which the elder sibling was a reactor than in those in which the elder sibling was not a reactor. This difference, however, became less marked with the higher age groups. Closeness of age in siblings also influenced the similarity of reaction. After making allowance for the influence of the important factors, geography, age, sex and race, there remained a factor which determines that the siblings of a reactor show a greater tendency to react with histoplasmin than the siblings of a non-reactor. There was, however, no evidence of a high proportion of reactors in some families and of non-reactors in others. The principal factor influencing sensitivity is not determined by familial environment but has a wider application.

*J. T. Duncan.*

LAM, F. K. & PRICE, S. **Histoplasmosis in Man.** *Hawaii Med. J.* 1947, May–June, v. 6, No. 5, 313–15.

"A human case of histoplasmosis, diagnosed at autopsy by the discovery of the causative organism in the tissues, is reported.

"So far as is known, this case was acquired in the Territory of Hawaii.

"This is believed to be the first case of histoplasmosis diagnosed in Hawaii."

WHIMS, C. B. **Coccidioidal Meningitis.** *Bull. U.S. Army Med. Dept.* 1947, May, v. 7, No. 5, 466–71.

It has been estimated that the central nervous system or its meninges is involved in 25 per cent. of the cases of fatal, disseminated, coccidioidal granuloma. The author describes two cases, in which apparent localization of the infection to the meninges occurred shortly after the primary stage of the disease. In both cases, signs and symptoms referable to meningeal disease or increased intracranial pressure were the outstanding clinical features. The diagnosis was difficult, because the earlier primary coccidioidomycosis had been assumed only on the ground of probability without convincing mycological evidence. The coccidioidin skin reaction was absent in one case and only feeble in the other. X-ray examination showed, in one case, signs of internal hydrocephalus, probably caused by lesions of the membranes at the base of the brain; and, in the other, a complete blockage at the level of the 5th cervical vertebra which, from biopsy, was found to be caused by dense adhesions between the three membranes, and a granulation tissue with pearly nodules on the dural surface suggesting tuberculosis. Bodies resembling the spherules of *Coccidioides immitis* were seen in sections of these nodules and in the cerebrospinal fluid of the other case, but their identity was not clearly established and all attempts to cultivate the fungus failed.

In both cases, the cerebrospinal fluid was under increased pressure, the protein content was increased and the sugar level low. There was usually a marked increase in the cell count, in which the small lymphocyte type predominated; eosinophiles numbered from 5 to 20 per cent. and this observation, in the absence of neuro-syphilis, cerebral cysticercosis and echinococcus disease, may be of diagnostic significance, although its importance cannot yet be assessed.

The diagnosis, in both cases, was eventually based on the complement-fixation reaction with *Coccidioides* antigen, and by the exclusion of other probable causes of chronic meningitis. *J. T. Duncan.*

BASTOS DA LUZ, J. V. & NOGUEIRA, J. F. P. Estudo experimental de poder patogénico de uma estirpe de dermatofita produtora de tinhas humanas. [**Experimental Study of the Pathogenicity of a Strain of Dermatophytes derived from Human Tinea.**] *An. Inst. Med. Trop.* Lisbon. 1946, Dec., v. 3, 195–206. English summary.

SALAZAR LEITE, A. & BASTOS DA LUZ, J. Parasitismo da pele e anexos por estirpes de *Trichophyton rubrum* (Castellani, 1910). [**Infection of the Skin and Appendages by a Strain of** *Trichophyton rubrum*.] *An. Inst. Med. Trop.* Lisbon. 1946, Dec., v. 3, 21–8, 5 figs. (4 coloured) on 2 pls. English summary.

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## HEAT STROKE AND ALLIED CONDITIONS.

MACPHERSON, R. K., LEE, D. H. K. & FURLONGER, E. **Atmospheric Conditions encountered during a Survey of R.A.A.F. Ground Crew on Tropical Service and their relationship to both Sweat Loss and the Results obtained with the Harvard Pack Test. (Ninth Report of Field Investigation into the Incidence of Tropical Fatigue).** 1947, Mar. 18, 5 mimeographed pp. Brisbane: University of Queensland.

The study described in this report was carried out in the South-West Pacific Area in three localities situated in latitudes 6° South, 1° South and 3° North. Atmospheric conditions were measured, the sweat loss of groups of subjects was observed while they performed a fixed task, and further observations were made with the Harvard Pack Test of physical performance. Each of 11 groups of subjects was tested for a few days and the whole series of observations was carried out between late November and mid-March.

The dry-bulb temperature averaged 88°F. over the whole series of observations, and the averages for the different groups varied between 83° and 92°. The intensity of solar radiation as indicated by the excess of the globe-thermometer temperature over the air temperature varied considerably in the different groups of observations. The average globe-thermometer excess varied from 9° to 23° in the different groups with an overall average of 15°. There was little variation in the absolute humidity of the air and the overall average vapour pressure was 20·5 mm. of mercury. The wet-bulb temperature likewise showed little variation and averaged 76·5°.

Each subject was weighed nude on two occasions during his physical examination. After the first weighing, he dressed and carried out the Harvard Pack Test, which involves extreme physical exercise lasting up to five minutes, and then he sat down for 15 to 20 minutes. Then he put up a pack weighing 18 kgm. and walked at the rate of three miles per hour for 30 minutes. After this he sat down for 30 minutes, and was then again weighed nude. The difference in weights was taken as his sweat loss. The average rate of sweat loss over the period of 80 to 90 minutes was 7·8 gm. per minute.

The rate of sweat loss was correlated with absolute humidity, dry-bulb temperature, globe-thermometer excess, and length of tropical service. Partial correlations were computed for sweat loss with each of the three environmental variables taken in turn, the remaining two being held constant. The highest correlation was with dry-bulb temperature ($r = +\cdot 30$), the correlation with globe-thermometer excess came next ($r = +\cdot 21$), while that with absolute humidity was still lower and negative in sign ($r = -\cdot 15$). Earlier laboratory experiments had given a zero-order correlation coefficient of ·95 between dry-bulb temperature and sweat loss. Attention is drawn to the negative partial correlation between sweat loss and absolute humidity, which was contrary to expectations and not in accordance with laboratory findings. It is remarked that the range of humidities encountered in the study was limited, and that the biological significance of the observed discrepancy is doubtful.

No evidence was obtained of any relationship between the rate of sweat loss and the length of tropical service. It is thought that the Australian subjects had already acquired that increased facility for sweat production which inhabitants of cooler countries have to develop on going to the tropics.

The score obtained with the Harvard Pack Test index had little or no correlation with environmental measurements. *T. Bedford.*

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## TROPICAL ULCER.

BLANK, H. **Tropical Phagedenic Ulcer (Vincent's Ulcer).** *Amer. J. Trop. Med.* 1947, May, v. 27, No. 3, 383–98, 5 figs. [70 refs.]

The seventy references in this paper are evidence of the diligence with which the author has delved into the ever obtrusive problem of tropical ulcer.

In a penetrating but concise review, he wisely opens the subject with a definition of tropical phagedaenic ulcer which he describes as " a specific, acute ulcerative skin disease with a characteristic slough containing numerous fusiform bacilli and spirochaetes in its early stages. If neglected, it may develop into a chronic non-specific ulcer which is indistinguishable from indolent ulcers resulting from other causes." The author adds that it is one of the purposes of his paper to attempt to clear up " some of the semantic confusion which exists in the literature of this complex disease." [It might be observed that if all writers on this subject were to open their descriptions with a precise definition, as the author has done, neither the disease nor the literature would appear quite so complex.]

The twenty topographical synonyms for tropical ulcer quoted by the author are alone indicative of the multiplicity of names for it ; the imposing list of countries in America, Africa, Asia and Europe set out by the author is evidence of its ubiquity.

The important clinical and histopathological characters of the disease are referred to, and the vexed question of aetiology discussed at some length. The author makes the important point that tropical phagedaenic ulcer was rarely seen in American troops in endemic areas, though they frequently acquired such specific infections as cutaneous diphtheria and cutaneous leishmaniasis. [The former condition sometimes causes confusion, both in description and in therapeutic claims : see this *Bulletin*, 1947, v. 44, 748.] Since these American troops had an opportunity for infection with tropical ulcer as great as that with diphtheria or leishmaniasis " one can only conclude that the problem is not simply one of infection, but rather of some change in the host which allows the lesion to develop."

The evidence in favour of the part played by Vincent's fuso-spirochaetes is weighed and discussed, and the relevant literature quoted at length : it is concluded on the basis of evidence to date, that the ulcers are probably caused by these organisms in a host made susceptible by vitamin B deficiency, and probably further debilitated by chronic disease and general malnutrition. The rôle of dietary deficiency and various predisposing diseases is noted, and the author observes with admirable caution that the aetiology " remains a complex problem which has not yet been finally settled."

In discussing differential diagnosis, it is pointed out that a positive clinical or laboratory diagnosis cannot always be made with certainty, especially in the chronic indolent stage. While the author mentions some of the many other conditions which might be confusing, he avoids further confusion by confining descriptions of differential characters to a few of the commonest lesions which require to be distinguished, namely desert sore, cutaneous diphtheria, pyogenic ecthyma, cutaneous leishmaniasis and syphilitic gummata. These are summarized adequately.

On the subject of treatment, the wide variety of therapy proposed in the past is referred to : " most agree that general medical principles apply here ; *i.e.* with local antiseptics, debridement, and rest, the ulcer will eventually be cleaned up. The search has been for the antiseptic that would be rapidly effective in all cases." The relative values of copper sulphate, " Bipp ", " zipp " and sulphonamides are discussed. The usual spirochaeticidal metals are apparently of little value. The ineffectiveness of arsenicals and bismuth in Vincent's lesions of the mouth is noted, and a more favourable parallelism between these lesions and tropical ulcers in their response to penicillin is pointed out : here the author records the successful treatment of Vincent's infections of the mouth—gingivitis, angina and noma—with penicillin, and quotes similar successes in the case of tropical ulcer [this *Bulletin*, 1946, v. 43, 958].

A case report is then given, which demonstrates the dramatic effect of intramuscular penicillin in clearing the phagedaenic phase of the disease. Penicillin only was given for the first week, to evaluate it fully. The patient, a young Chinese soldier, had a deep tropical ulcer on his leg for about a week. He was given 20,000 units of sodium penicillin intramuscularly every 3 hours, to a total of 360,000 over 2½ days. Smears for fuso-spirochaetes became negative immediately and penicillin was discontinued. A week later on an adequate diet alone, healing continued. Other treatments were then instituted, which included multi-vitamin supplements, vermifuges and ferrous sulphate. The patient gained in strength, his low blood count became normal and the lesion cleared up. In 10 weeks, a thin but adequate scar was noted. These stages are strikingly illustrated in four excellent photographs. Because of the " superb results of other investigators " and his own experiences, the author believes that penicillin will probably become the treatment of choice in the active phase of tropical ulcers : the chronic stage requires surgical treatment.

[It is greatly to be regretted that the results of treating only a single case are given, since they are insufficient to support the author's conclusions regarding penicillin therapy, hopeful though the signs may be. The author has, however, done a considerable service in reviewing and re-assessing the vast amount of material which has accumulated on the subject of tropical ulcer : that he has done so with such thorough and critical a balance is not only welcome as a summary in itself, but is also a timely reminder that such an overhaul of the wood and the trees alike was long overdue. This careful paper should be read in the original by all practitioners in the tropics.] *H. J. O'D. Burke-Gaffney.*

## MISCELLANEOUS DISEASES.

GELFAND, M. **Symmetrical Gangrene in the African.** *Brit. Med. J.* 1947, June 14, 847–9, 2 figs.

Six cases of symmetrical gangrene are described in Africans from Southern Rhodesia. In four, the gangrene was limited to the toes and in two was more extensive. The patients were all males, of whom five were aged between 20–35 : the other 55.

Oedema was the first sign, followed by the symmetrical gangrene, becoming moist in one case. No common cause could be found for the gangrene. It is suggested that these cases bear the closest resemblance to " Bilateral gangrene of the digits in the young " described by Lewis (1936, *Vascular Disorders of the Limbs*) or the gangrene in the extremities recorded in prisoners of war in the Far East. The paper is illustrated by two photographs.

*Clinton Manson-Bahr.*

SALTER, J. G. **Symmetrical Gangrene in the African.** [Correspondence.] *Brit. Med. J.* 1947, July 19, 108–9. [13 refs.]

An account of a case in an Ethiopian [see above].

HALL, G. A. M. **Tropical Eosinophilia or Pulmonary Acariasis.** *Brit. J. Tuberculosis.* 1946, Oct., v. 40, No. 4, 124–9. [13 refs.]

Eosinophilia in tropical patients associated with chronic pulmonary symptoms and radiological mottling of the lungs, the condition responding to treatment with organic arsenical drugs, is now well known under the name tropical eosinophilia ; in several cases, mites have been found in the sputa of such patients, and have been suggested to be the cause of the disease. The first patient described in the present paper presented this syndrome and was successfully treated with carbarsone. The second patient differed in that he had no history of residence in the tropics, and mites were not demonstrated in his sputum ; he had, however, worked in a dusty fruit store, and the author believes that his condition was essentially the same as tropical eosinophilia. [See also WILSON, this *Bulletin*, 1947, v. 44, 851]. *F. Murgatroyd.*

JACOBY, H. **The Toxic Effect of Teora (Khesari) on Man. Protection of the Public by Legislation and Conversion of Teora into Fodder.** *Indian Med. Gaz.* 1947, Mar., v. 82, No. 3, 122–5.

Teora and Khesari are two of the many synonyms of *Lathyrus sativus* [and probably other species of *Lathyrus*]. The toxic principle of *Lathyrus* has not been isolated and some at least of the symptoms of *lathyrism* may be due to a contaminating mould such as causes threshers' disease [see *Bulletin of Hygiene*, 1947, v. 22, 121] and belonging to the *Alternaria*, the *Gibberella*, or the ascomycete *Chaetomium*. The fungi do not grow on fresh wheat grains but only on wheat which has been lying on wet fields or is stored in the wet. During the months February–July, when the fresh teora crop is eaten, lathyrism does not occur, but after the onset of the July monsoon, when the grain is damp, the eating of it from August onwards is followed by appearance of cases. Symptoms develop after about a month on such food, so the peak of the disease is in September and October. Persons in some houses are attacked, those in others escape because some families are more careful to store the grain in a dry place. Apparently the fungus is harmless to animals, in fact is a valuable nutritious food for them. The author suggests that teora should be prohibited as food for man and be made unsuitable by unpalatable adulteration ; that the Government should buy up the entire crop and, after such adulteration with linseed

oil-cake and salt, should resell it to cattle-owners. In the meantime, research to determine the toxic element in teora should be undertaken; and when it has been discovered, steps should be taken to remove it and the residue might prove to be a good, cheap and staple food for man. [See also this *Bulletin*, 1946, v. 43, 492.] *H. Harold Scott.*

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## GENERAL ENTOMOLOGY.

GINSBURG, J. M. **Results from feeding Mosquito Larvae, killed by DDT, to Goldfish.** *J. Econom. Entom.* 1947, Apr., v. 40, No. 2, 275–6.

"The results suggest the following two conclusions: First, goldfish may feed just as readily on dead as on live mosquito larvae. Second, mosquito larvae killed by DDT are not poisonous to goldfish."

FOX, I. **Two New Central American Biting Midges or Culicoides (Diptera: Ceratopogonidae).** *Kuba.* Habana. 1947, Apr., v. 3, No. 4, 90–91, 4 figs. [Summary in English by the author.]

"Two new species are described and illustrated, *Culicoides panamericanus*, n.sp., female, from Mexico and *C. wokei*, n.sp., female, from the Canal Zone (Panama)."

WHARTON, G. W. **Studies on North American Chiggers. 1. The "Akamushi" Group.** *J. Parasitology.* 1947, June, v. 33, No. 3, 260–64, 1 fig. [10 refs.]

FOX, I. *Ornithodoros puertoricensis*, **a New Tick from Rats in Puerto Rico.** *J. Parasitology.* 1947, June, v. 33, No. 3, 253–9, 3 figs. [22 refs.]

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## LABORATORY PROCEDURES.

LILLIE, R. D. **Reactions of various Parasitic Organisms in Tissues to the Bauer, Feulgen, Gram, and Gram-Weigert Methods.** *J. Lab. & Clin. Med.* 1947, Jan., v. 32, No. 1, 76–88. [10 refs.]

This paper contains extremely detailed observations on the examination of many tissue parasites by the Bauer reaction for glycogen, the Feulgen, Gram and Gram-Weigert methods. It does not lend itself to abstraction. The following points are, however, worthy of special note:—

A number of protozoa and various stages of helminths showed sharply stained nuclei by the Feulgen method. Those with poorly stained or dubiously Feulgen-positive nuclei included *Entamoeba histolytica*, *Torula histolytica* and *Histoplasma capsulatum*. Feulgen staining material was not present in mycelial fungi, bacteria, rickettsiae and *Coccidioides immitis*. The Weigert-aniline xylene-Gram variant usually gave more Gram-positive organisms than the Gram-acetone method.

Among other organisms, *Entamoeba histolytica* contains in its cytoplasm Bauer-positive polysaccharides digestible with ptyalin and malt diastase; it is stated that the Bauer method is a valuable aid in detecting scarce amoebae and yeast-like fungi in tissues, and that it also demonstrates the remaining fragments of schistosome eggs in granulomata, not readily identifiable by other means.

*Encephalitozoon* shows some resemblance to coccidioides and to histoplasma in its possession of a Bauer-positive enzyme-resistant capsule and in its partially

Gram-positive reaction. The author considers that the present data accentuates still further the doubt expressed by WENYON and others regarding the protozoal nature of this organism: and they recall that *Coccidioides* and *Histoplasma* were originally believed to be protozoa.

[The employment of these methods gives a wealth of information regarding the staining and morphology of a wide variety of tissue parasites, protozoal, helminthic and fungal. Practical parasitologists should derive considerable profit from the perusal of this informative paper.]

*H. J. O'D. Burke-Gaffney.*

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## BOOK REVIEWS.

PESSÔA, Samuel Barnsley [Professor catedrático de Parasitologia da Faculdade de Medicina da Universidade São Paulo, etc.]. **Parasitologia Médica.** [Medical Parasitology.] 858 pp., 367 text figs. & 31 coloured figs. on 1 pl. 1946. São Paulo: Editora Renascença S.A., Rua Marconi, 53. [Cr. $310,00.]

The author does not make the time-honoured claim that this work is intended to fill a gap in medical literature, for there is no such gap. There are plenty of books dealing with protozoology, helminthology and entomology and a spate of articles dealing with special points of research in each of these. The purpose of the author was to provide, in a single volume, information on all these divisions of parasitology, to meet the requirements of students of medicine in Brazil, and, be it noted, "student of medicine" is not the same as "medical student", for this book will appeal equally, perhaps even more, strongly to the post-graduate student. The author is to be heartily congratulated on the result of his efforts and the efficient completion of his task. He deals with the subject of parasitology in its widest sense; he describes the morphology and biology and epidemiology of the various parasites, but he goes far beyond this and gives account of the pathological conditions which they cause and the treatment of these conditions, curative and prophylactic.

Readers must bear in mind that this work does not aim at covering the whole field of parasitology, but only—at all events, mainly—such matters as are of importance and interest to practitioners and research workers in Brazil. Hence, on the subject of trypanosomiasis, for example, *T. cruzi* and Chagas's disease are treated fully, but African trypanosomiasis is disposed of in four pages and the *rhodesiense* form in 11 lines; again, schistosomiasis due to *S. mansoni* has 28 pages devoted to it while *S. haematobium* and *S. japonicum* are merely mentioned and are disposed of in half a page.

Each parasite is considered under the following headings, where appropriate: history of discovery, habitat, morphology, biology, culture, transmission, pathology and immunology, symptomatology, diagnosis and treatment. The whole consists of five parts; the first and last call for special note, the others discussing individually the parasites, protozoal, helminthic and entomological, are clearly described on the usual lines of all good text-books. The first part speaks of parasitism in general, commensalism and symbiosis, and geographical distribution; this is succeeded by a chapter on the reaction between the parasite and the host—mechanical, as obstruction by a collection of *Ascaris*, or pressure from growth of hydatid; spoilation or deprivatory, as by tapeworm and hookworm; toxic as by *Sarcocystis*; and immunological effects. The last chapter of this part gives a clear statement of the rules of nomenclature;

illustrated by examples. The whole of this part by its clarity of exposition goes to show that the author must be in the front rank of teachers. Part V gives precise instructions on laboratory techniques, cultivation, staining, etc., used in parasitology. Throughout the work are valuable keys for identification of genera and species.

The whole is clearly printed, on good paper with adequate margins and spacing; misprints are few and obvious so that no real harm results from them; the illustrations, most of them original, are excellently reproduced, the binding exceptionally good—a boon in these days when so often a work one wishes to keep for frequent reference falls apart at the first reading. In sum, the object for which the work was written—instruction of the worker in South America—has been fully attained. *H. Harold Scott.*

KOJEVNIKOV, P. V., DOBROTVORSKAYA, N. V. & LATYSHEV, N. I. [**Cutaneous Leishmaniasis: a Treatise for Physicians and Biologists.**] (State Publishers of Medical Literature). 371 pp., 126 text figs. 1947. Moscow. [In Russian.] [32.50 Roubles.]

Cutaneous leishmaniasis is widely distributed in the Middle Asian republics of the Soviet Union and, to a lesser degree, in Transcaucasia. In some areas this disease is a veritable scourge, producing severe epidemic outbreaks, especially among non-immune newcomers (settlers, troops etc.). During the recent war the endemic regions were visited by many people from the European part of U.S.S.R., with the result that numerous cases of infection appeared among them. The re-evacuation of these people served to spread the disease throughout the Union and, in view of the long duration of some forms of oriental sore, such cases are likely to be encountered outside the endemic areas for some years to come by medical practitioners, many of whom have no experience of this disease and are further handicapped by the lack of a reliable guide to the subject. This gap has been filled by the present monograph, which gives a comprehensive account of all aspects of cutaneous leishmaniasis. Written jointly by two clinicians and a parasitologist, it serves the practical needs of the physician and epidemiologist and at the same time provides a theoretical background for the parasitologist and zoologist. Many of the data given in this book are original, being based on investigations carried out in recent years by the authors and their associates.

An introductory chapter deals with various types of cutaneous leishmaniasis, of which the authors recognize at least three: the South American mucocutaneous form and two forms encountered in Middle Asia and probably in other localities as well, *viz.* the "dry" or late ulcerating form and the "moist" or early ulcerating form. In discussing the nomenclature used in cutaneous leishmaniasis the authors suggest that the archaic terms used to describe the lesions (*e.g.* sores, boutons, ulcers etc.) should be abolished and replaced by a new term "leishmanioma", to denote any lesion developing at the site of inoculation of the infection, while secondary lesions resulting from dissemination of the parasites are described as "dissemination nodules". This chapter also deals with the geographical distribution of cutaneous leishmaniasis throughout the world, with special reference to the Soviet Union, with its race and age incidence, and with its individual and social importance. The next section is devoted to the history of our knowledge of cutaneous leishmaniasis, from the ancient records to our own times. The succeeding section deals with the aetiology, and includes the classification of the Trypanosomidae, a description of the morphology and life-cycle of members of the genus *Leishmania* in mammals and other vertebrates, methods of cultivation, and a discussion of their affinities.

Among the causative organisms of cutaneous leishmaniasis the authors recognize, in addition to *L. brasiliensis*, two morphological varieties of *L. tropica* : *L. tropica* var. *major* and *L. tropica* var *minor*, which were created by YAKIMOFF [see this *Bulletin*, 1915, v. 6, 225]. The former variety is said to be responsible for the " moist " type of oriental sore, while the latter causes the " dry " type.

In the succeeding section an exhaustive account is given of the clinical course of cutaneous leishmaniasis. First a description is given of the characteristic features of the two types encountered in Middle Asia [for a summary of these see this *Bulletin*, 1944, v. 41, 331]. These are compared with the forms of the disease occurring outside the Soviet Union, after which the features common to all variants of oriental sore are described. This section also deals with the diagnosis of oriental sore and includes a short account of muco-cutaneous leishmaniasis. This section is followed by chapters on histopathology and immunity in cutaneous leishmaniasis, including various serological reactions used in the diagnosis of the disease and the practice of vaccination. Experimental infection of mammals is also described in this section, while the following is devoted to treatment and deals very fully with chemotherapy, immunotherapy and physiotherapy, as well as with local treatment. The section on epidemiology is of particular interest since it comprises much original work carried out by the authors in Middle Asia. In connexion with the rôle played by gerbils as reservoir hosts of the " moist " type of the disease [this *Bulletin*, *loc. cit.*], a detailed account is given of the ecology and of incidence of leishmanial infection in these rodents. As regards the " dry " type, man is thought to be the chief source of infection. This section also deals with transmission and comprises an account of the anatomy, life-history, ecology and systematics of sandflies. The last section is devoted to prophylaxis and control of cutaneous leishmaniasis, with a description of measures directed against the rodents and sandflies as sources of infection, on the one hand, and measures for protection of the human host, on the other. In an appendix instructions are given for the collection and preparation of sandflies. The monograph is adequately illustrated, but unfortunately some of the figures have suffered in reproduction. There is an extensive list of literature, arranged according to subjects, but a subject index is lacking.

The authors are to be congratulated on producing the first monograph on cutaneous leishmaniasis which covers the whole subject in a comprehensive manner. Its value to medical practitioners and to research workers cannot be overestimated, for it serves not only as a practical guide to the diagnosis and treatment of the disease but also provides material for the study of problems requiring further investigation. *C. A. Hoare.*

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SCIENCE TO-DAY. Published by the Weekly Science Newsletter, Ltd., 104 Clifton Hill, London, N.W.8. Subscription rates: 30*s.* a year or 15*s.* 6*d.* for six months.

Readers of this *Bulletin* may be interested to know of the pamphlets published each week, under this title. Each pamphlet (roughly 5 in. × 7¼ in., and containing some 8 pages) includes short articles relating to recent advances in scientific work, some of which deal with medicine. For instance, in the issue dated July 24, 1947, there are articles on the Chemist and Bacteria, the Upper Atmosphere, and on nutrition. Book reviews are also included.

The articles are very brief, but are carefully written for the intelligent layman; they contain much information which would interest students and teachers in the Colonies. *Charles Wilcocks.*

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